...ril 15, 1948

AUTOMOTIVE INDUSTRIES

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...ord's Novel Fabrication Method for Coil Springs

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Europe's Largest Automobile Show

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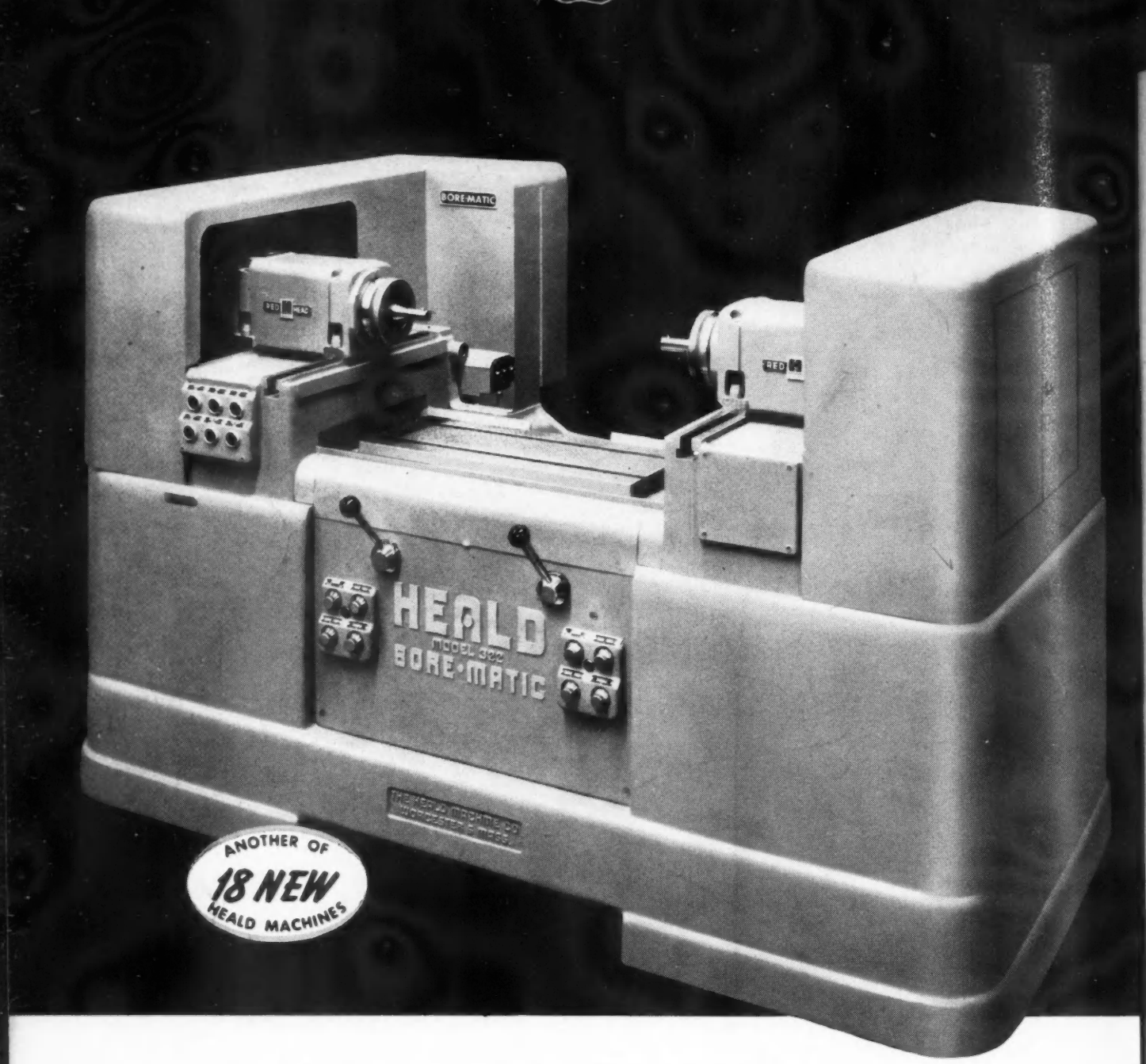


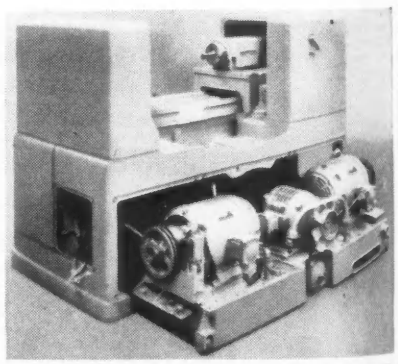
Another *COMPLETELY NEW* Heald Bore-Matic with Double-End Capacity!

• **Faster cycles. Constant speeds. Simplified operation.** These and many more exclusive features make the Heald Model 322 a *completely new* Double-End Bore-Matic—compact in size, but big in capacity.

Borize your medium-size parts on it. It does more in a minute than you ever imagined. Arrange it with multiple spindles at either end for large, awkward work. It bores, turns, faces, chamfers, grooves, fly cuts—with greater power in the cutting and a higher precision in the finish.

The Model 322 is only one of an entirely new line of Heald precision finishing machines—Bore-Matics, Internal Grinders, Surface Grinders—eighteen in all, and each one completely new. There are years of engineering experience behind them—years of uninterrupted, cost-cutting production ahead. The Heald branch office in your part of the country will be glad to give you complete details.

SEND FOR BULLETIN on this Heald Model 322 Bore-Matic and on its smaller double-end partner, the Heald Model 222.



Rear view of Model 322 Bore-Matic shows hydraulic power unit rolled out for easier maintenance, large built-in pan for chips and cutting fluid, electrical control box top right.

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

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AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

April 15, 1948 Vol. 98, No. 7

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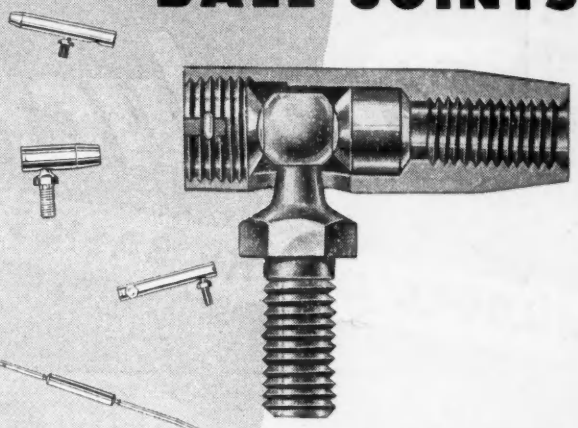
TOUREK

BALL JOINTS



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When special ball joint assemblies or precision screw machine products are necessary to meet requirements for new applications, Tourek's designing and manufacturing experience provides a source of valuable assistance.

Write for Tourek's 16-page ball joint catalog—it contains complete specifications on standard types and sizes, as well as data on special types.

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4701 W. 16th Street, Chicago 50, Illinois

MAKERS OF PRECISION SCREW MACHINE PRODUCTS

ESTABLISHED 1920
TOUREK
FAMOUS BALL JOINTS

AUTOMOTIVE INDUSTRIES. Vol. 98, No. 7. Published semi-monthly by Chilton Co. Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, $2.00 per year. Canadian and Foreign $5.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 15th), 50 cents.

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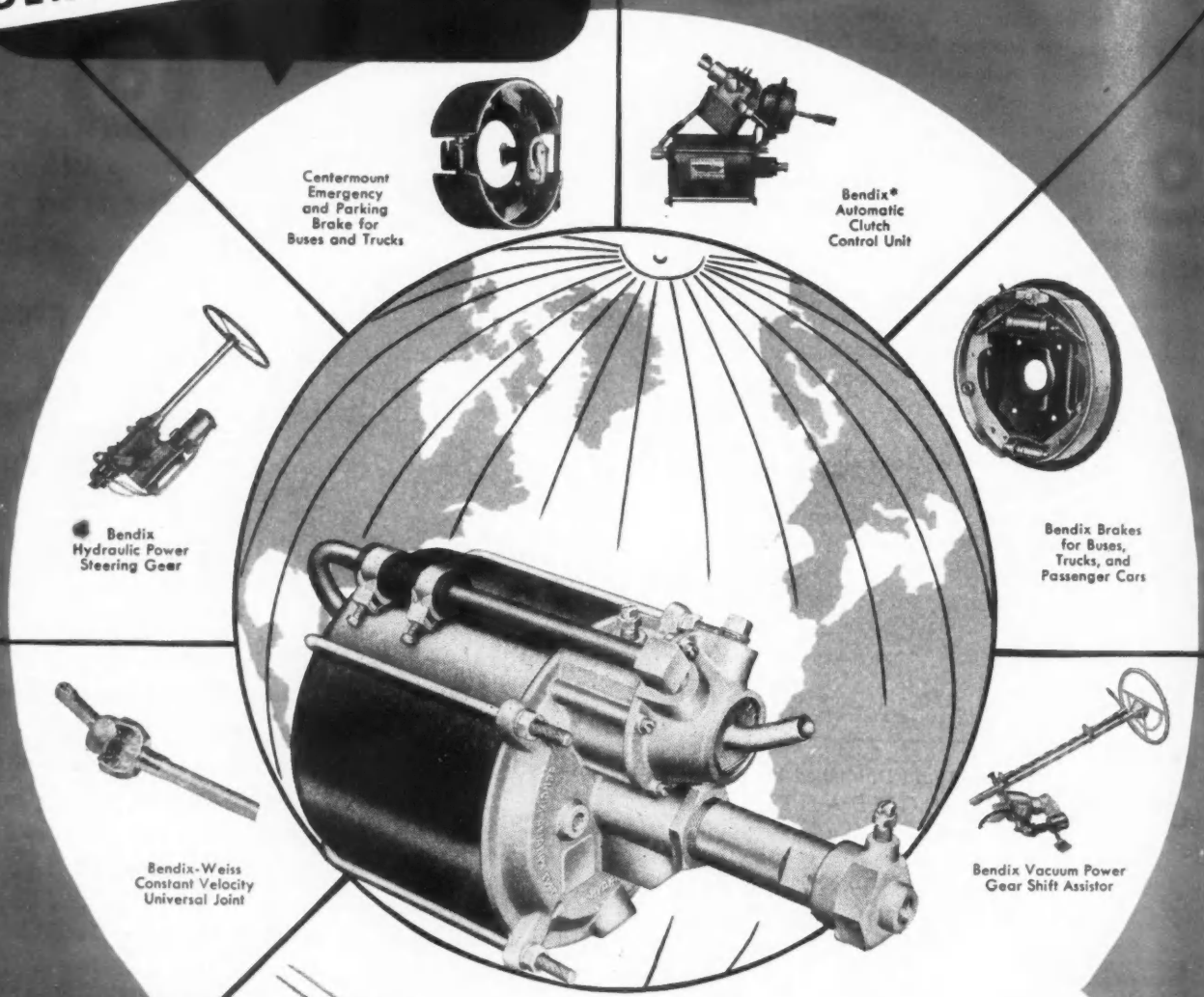
BUILDERS OF THE BASICS OF BETTER MOTOR VEHICLES


Centermount Emergency and Parking Brake for Buses and Trucks
Bendix* Automatic Clutch Control Unit
Bendix Hydraulic Power Steering Gear
Bendix Brakes for Buses, Trucks, and Passenger Cars
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World's Most Widely Proved Power Brake!

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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

Two New Lincolns

First 1949 cars to be announced are the two new Lincolns: the Lincoln and Lincoln Cosmopolitan. These completely redesigned models feature a new 152-hp V-8 engine, independent coil-spring suspension in front, and a new frame and chassis construction. They are available in eight impressive body styles. For pictures and description of the new models, see pages 26-28.

Geneva Automobile Show

Europe's largest automobile show since before the war presented more than 400 exhibitors from 10 countries, displaying a glittering array of new passenger cars, trucks, motorcycles and bicycles. Complete coverage of the event is on pages 30-33.

Magnetic Fluid Clutch

A new type of magnetic fluid clutch, based on an heretofore unknown property of magnetic particles in an oil mixture, offers tremendous possibilities for use with planetary transmissions in autombiles. A full description of its operation, design principles and advantages, authored by Engineering Editor Robert C. Mack, is given on pages 38-40.

Aluminum Parts in Ford and Mercury Cars

The Ford Motor Co. has eliminated approximately 60 lb of steel in the Ford and Mercury models through the use of aluminum, an annual steel savings of around 21,750 tons. How this cost savings was accomplished is related in the article on pages 42 and 43.

Lighter and Stronger Car Bodies

According to conclusions reached by two research engineers at the University of Michigan, the strength and rigidity requirements of the conventional passenger car can be met by a lighter frame and body structure built in accordance with aircraft design principles. For further information, see the article on pages 46-48.

23 New Product Items And Other High Spots, Such as:

Availability of X-435 synthetic rubber; a washing machine for cylinder blocks; a new method for fabricating coil suspension springs; Hudson engine production; a new high-speed British car; aircraft gas-turbine engine specifications; distinctive features of the Playboy car; and a sectional drawing of the Willys six-cylinder engine.

News of the Automotive Industries, Page 17
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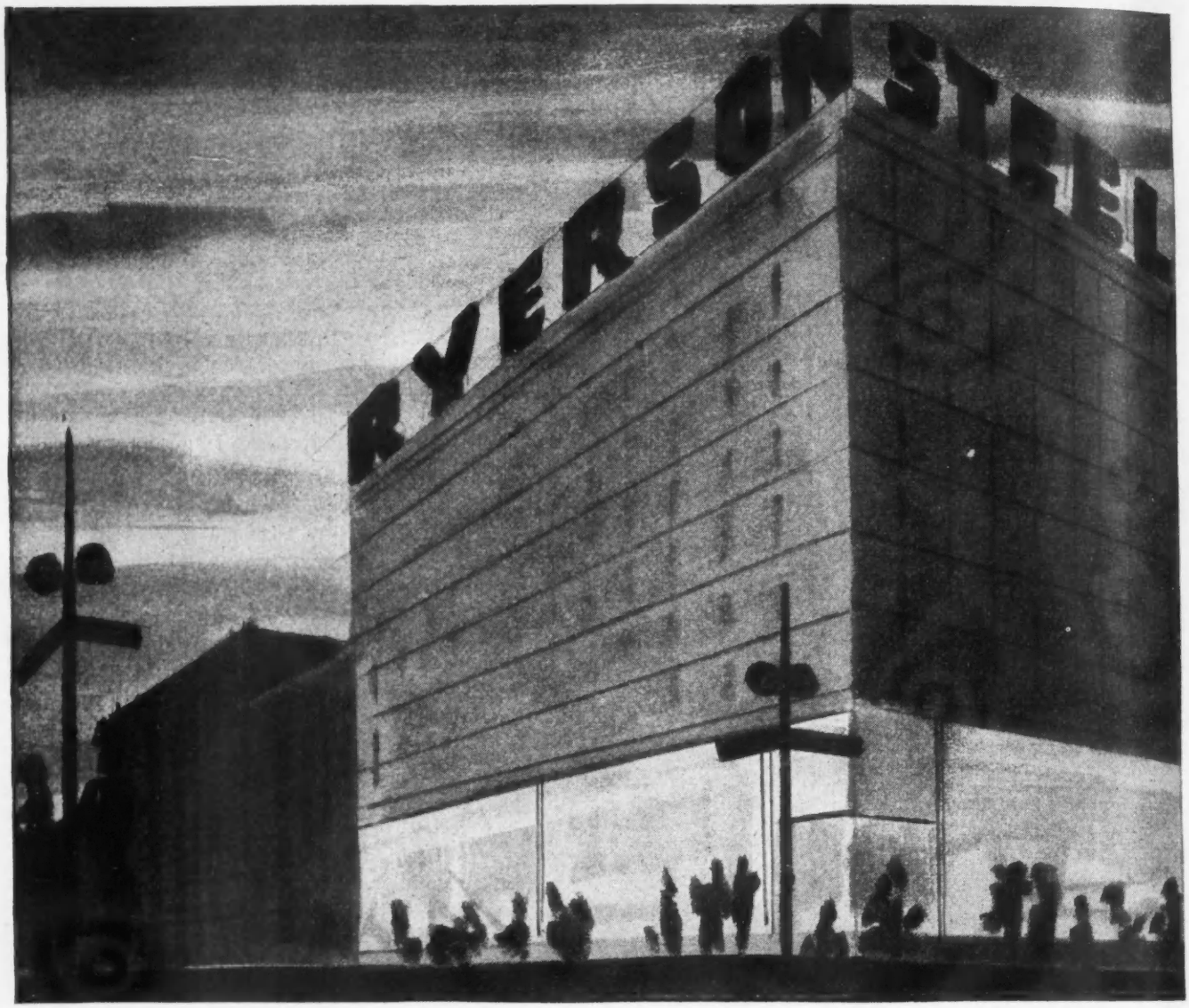


The Department Store Idea

When you think of a Ryerson Plant, picture a huge department store featuring all kinds and shapes of steel. In place of the ordinary sales personnel, think of a large staff of experienced steel men—a sales department that's been carefully trained to guide your steel purchasing—to see that you get the exact steel you need for the job at hand.

And, when you think of Ryerson Steel-Service, think of a smooth-flowing system of steel supply that eliminates every unnecessary delay between order desk and point of delivery. Think of the most modern steel storing, cutting and shipping methods —methods based on more than a century of performance. And remember that Ryerson Steel-Service functions with the same efficiency and promptness whether your order calls for pounds or tons.

Naturally, today's great demand for steel frequently unbalances our stocks. But if the steel you need is not immediately available, we'll gladly do everything possible to supply you with a practical alternate.

What does it all add up to? Well, just about the last word in steel-buying convenience. And it's all yours when you contact a Ryerson Plant for any steel requirement.

Joseph T. Ryerson & Son, Inc. Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco.

RYERSON STEEL

NEWS of the AUTOMOTIVE INDUSTRIES

Vol. 98. No. 7 April 15, 1948

March Output Hits New Postwar High

Although March automobile and truck production hit a new postwar high of an estimated 509,000 units, prospects for April are dim. The effect of the coal strike is bound to be felt, whether or not it is settled before mid-month, and chances to keep production rolling for more than the first two weeks of the month, if the miners were not back at work, were considered very remote. The automobile plants have plenty of coal on hand for their own use, but the crippling effects of the coal strike on steel production would force suspension of operations if continued beyond the first week of April, automotive spokesmen predicted. However, despite all the roadblocks, the industry managed to turn out an estimated 1,393,000 cars and trucks in the first quarter of this year in U. S. and Canadian plants. U. S. production alone is calculated at 937,000 passenger cars and 355,000 trucks for a total of 1,292,000. The postwar high reached in March was about 27,000 higher than the previous record set last December.

Detroit Not Yet Affected by Armament Program

Rumors persist from outside Detroit that drastic things are going to happen to automobile production because of the international situation, and the needs of armament programs. However, no one in Detroit seems to know anything about such a serious prospect. The general thinking is that it is still too early to tell what effect an armament program will have until the money is appropriated and the military services decide what they want. Even then, except for an emergency, the principal effect would be on the supply of materials, rather than on any conversion of plant capacity to munitions production, since it appears that the chief objectives, at least at the outset, will be for planes. The aircraft industry certainly has plenty of capacity to handle a sizeable expansion program for the Air Force. Some of the parts companies might take on production of some parts, but it is believed that it would not affect their ability to produce automotive parts.

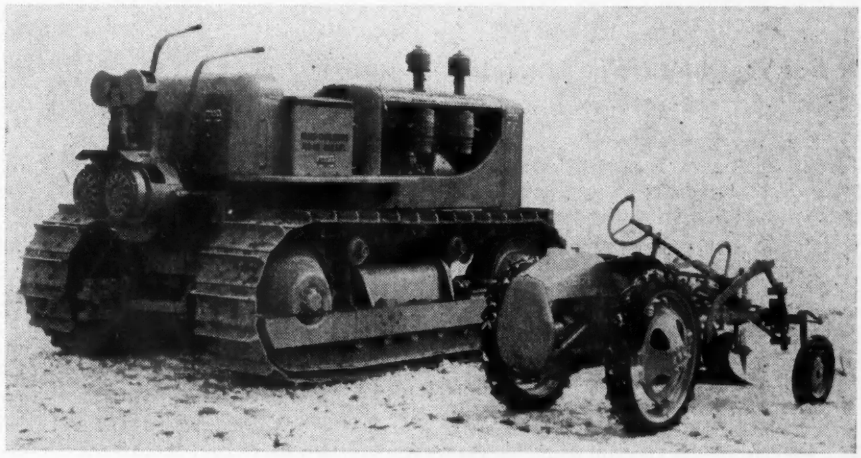
So far as can be discovered, there have been no orders received by the automobile manufacturers for war goods, other than the small development projects which have been in progress since the end of the war. There are indications that the military services have been surveying industrial plants throughout the country with a view to exploring what products could be made where and how soon in case of an emergency.

Weather and War Scare Boom Car Sales

Orders for new cars and sales of used cars have spurted with the recent war scares and the return of warm weather. After being in the doldrums for several months, the used car market bounded back in recent weeks, and in Detroit feverish buying practically cleaned up all inventory on used car lots. Prices were up substantially over previous levels, although they did not attain the high that prevailed last fall. Backlogs of orders for new cars, especially among the Big Three, are reported to be climbing at an even faster rate than prevailed in January and February. Cadillac reported that the order backlog had climbed from 90,000 in January to 120,000 by the end of March. Oldsmobile at the same time said that its unfilled orders totaled nearly 420,000, compared with 270,000 last July. Current rumors that automobile production may be curtailed are credited with having much to do with the sudden spurt in buying activity.

More New Lines of Lower Priced Tires

Further evidence that tires are back in a buyer's market is the introduction early this month by Goodyear Tire & Rubber Co. of a second and third line of tires. They will be priced at $1.30 and $2.85 respectively under the first line product in the 6.00 x 16 size. The Firestone Tire and Rubber Co. has also revealed the addition of two new tires, the Super-Champion and Standard, both in the low price field. Smaller companies had offered a cheaper priced tire before Goodyear made the move.



THE LATEST IN LIGHTWEIGHTS

Featuring a rear-mounted engine, Allis-Chalmers' new Model G tractor, now in production, is powered by a four-cyl engine. Capable of handling one 12-in. plow in average soils at customary depths, this new lightweight tractor is shown beside A-C's HD-19, reportedly the world's largest tractor

K-F Made $19 Million in 1948

A consolidated net profit of $19,015,677 and net sales of $260,132,988 were disclosed recently by Kaiser-Frazer Corp. This compares with 1946 operations which resulted in net sales of $11,504,443, and a net loss of $19,284,681. In 1947 K-F turned out 144,508 automobiles.

NEWS *of the* AUTOMOTIVE INDUSTRIES

BUNDLES FOR AMERICA

The biggest single shipment of cars ever to leave England was the cargo of 395 new 1948 British Austins, with a retail sales value of about $700,000, carried by the S. S. Pacific Stronghold recently. Austin has already sold almost 3000 of the new models in the United States.

L-M Plans Intensive Market Penetration

At a press preview in Detroit, Joseph E. Bayne, L-M sales manager, said that the division is planning a more intensive penetration of the market with its 1949 models. In the Mercury price field the company is aiming at a 12 per cent share of the market this year, compared with ten per cent in 1946, and six per cent in 1941. The division hopes to get 17 per cent of the potential sales in the Lincoln price field with competition aimed principally at Buick and Cadillac. In this field Lincoln had 12 per cent last year, ten per cent in 1946, and five per cent in 1941. Current plans call for producing twice as many of the lighter Lincoln as of the larger Cosmopolitan model. A new Continental model is under development for the limited custom market, and will probably be introduced early next year.

Crosley Aiming at 1% Of Market

Crosley Motors, Inc. has no elaborate plans for competing with the Big Three, but believes that it has a definite place in the automotive picture, according to Powel Crosley, Jr. He said that his company will be satisfied with one per cent of the passenger car market. Crosley so far has produced 35,000 units since the start of production in June, 1946, and expects to build 40,000 cars this year. Capacity of the plant is 160 units a day, and current production is running about 140 cars. Mr. Crosley said that pricewise his company must keep substantially under the lower priced lines of the Big Three, but that the exact formula has not yet been determined.

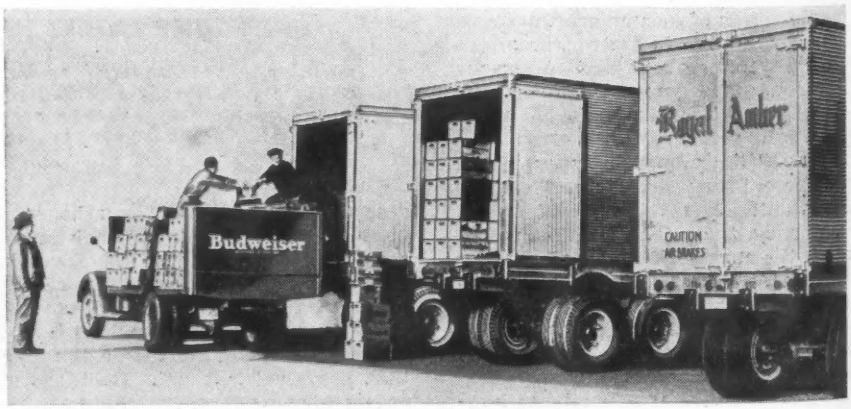
Mr. Crosley also revealed that experiments are underway by an aircraft company to use the 26.5 hp Crosley engine in a small one-place airplane to sell for under $1000. The craft would have a 400 mi range with a 700 lb load. The propeller would be driven by V belts. The engine and parts have been tested by CAA.

K-F Invests $18 million in Tools & Equipment

Kaiser-Frazer Corp. is completing the investment of $18.5 million in tools, fixtures, and equipment aimed at improving current production and reducing costs. Edgar F. Kaiser, vice president and general manager, told dealers recently that the company is making progress in lining up better vendors in a move to keep prices down. He revealed that K-F has obtained a loan of $10 million from the Bank of America to cover short range financing, and that the First Boston Corp. has been retained as financial adviser on the price, timing, and amount of long range financing.

Romney Resigns from AMA, Cronin Succeeds

George Romney, managing director of AMA since 1942, has resigned to become assistant to George W. Mason, president of the Nash-Kelvinator Corp. Mr. Romney had been associated with AMA for the past nine years. His responsibilities at Nash will include both the automotive and electrical appliance divisions. The board of directors of AMA has elected William J. Cronin, who has been associated with the organization since 1933, to succeed Mr. Romney as managing director. Since joining AMA, Mr. Cronin has been secretary of the association's manufacturers committee, and of the sales manager's committee.



WHEELED WAREHOUSES

These five stainless steel Fruehauf trailers are being used as mobile warehouses by the Service Distributing Co., Dayton, O., distributors of beer and ale. Originally a temporary arrangement, the operation has been so successful that plans for a permanent warehouse have been abandoned.

NEWS of the AUTOMOTIVE INDUSTRIES

Briggs Claims Development of Unitized Body

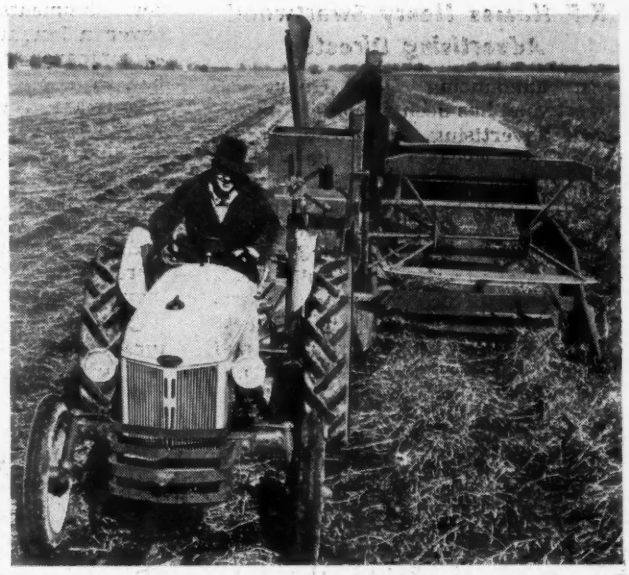
While the current trend toward the unitized automobile body construction is receiving considerable attention as an advanced development, Briggs Mfg. Co. points out that it pioneered in this type construction on the 1936 Lincoln-Zephyr. The company made this point in reviewing its "firsts" in connection with production of the ten millionth Briggs body recently. Briggs also claims credit for being the first to build a low-cost closed automobile body, and also to be the initial user of plastic decorative panels. The company was founded in 1909, but did not manufacture complete car bodies until 1919. A short time later it became the first body builder to put body manufacture on a mechanized conveyor basis. It has also pioneered in several welding methods, use of framing jigs and fixtures, press operations, and fabrication of trim and molding.

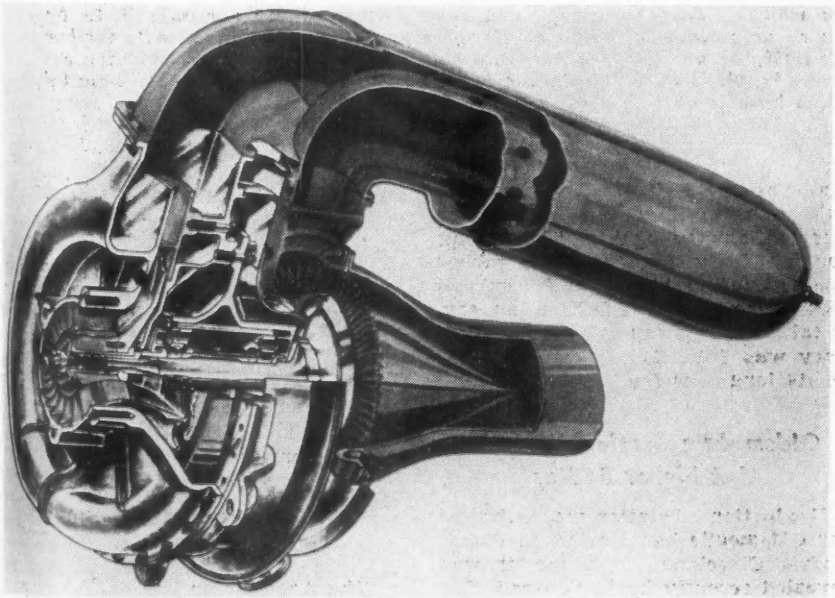
K-F Drops Aluminum Top Experiment

Interesting information on Kaiser-Frazer plans for aluminum car tops and the abandonment of a front-wheel drive car was revealed in Washington recently. In hearings before a House Public Works subcommittee, Clay P. Bedford, K-F vice president, revealed that the company had sold a considerable tonnage of aluminum in connection with a sale of steel to a brokerage firm. He added that the aluminum was no longer needed when the company decided to discontinue an experiment in making aluminum car tops. He also disclosed that tools and dies no longer required after plans for a front end drive car were abandoned were disposed of in connection with another sale of steel.

COMPLETE COMBINE

Accomplishing a complete harvesting job in one operation, this new combine, is a product of the Wood Brothers, Inc. a subsidiary of Dearborn Motors Corp. It has a cut of six ft, and although drawn by a tractor, has an independent four-cyl, 20-hp engine to power its mechanism.





TINY TURBO JET

For use in target planes, the Navy has developed this small, lightweight experimental jet engine through the West Engineering Co., Los Angeles. Weighing 181 lb, this engine develops 214 lb of static thrust. It has a one-stage compressor, a single cylindrical combustion chamber, and a single-stage turbine.

Labor

UAW Members Assessed for Strike Fund

Labor observers in Detroit do not see any great threat in the action of the UAW-CIO executive board in levying a $1 special assessment on its members toward the union's strike fund. Receipts of the assessment will increase the fund to nearly $2 million. However, while the total appears large, it would not go far in supporting a major strike against a large company, such as GM. The union has an estimated 160,000 GM members, and in the event of a strike, a payment of $12.50 to each one would liquidate the fund. There is little evidence at the present that any sizeable strikes will come in the automobile industry this year. Negotiations thus far between the union and GM have been very quiet and are expected to drag on for a considerable period. Neither side appears to be very much in a hurry to push things to a conclusion, apparently wishing to wait for current unsettled conditions to stabilize a bit. The Chrysler contract is open on economic discussions only, but negotiations there also are desultory. The Ford local is reported to be planning to ask that wage talks be opened soon, although the contract does not call for them before July 15.

NEWS *of the* AUTOMOTIVE INDUSTRIES

K-F Names Henry Swartwood Advertising Director

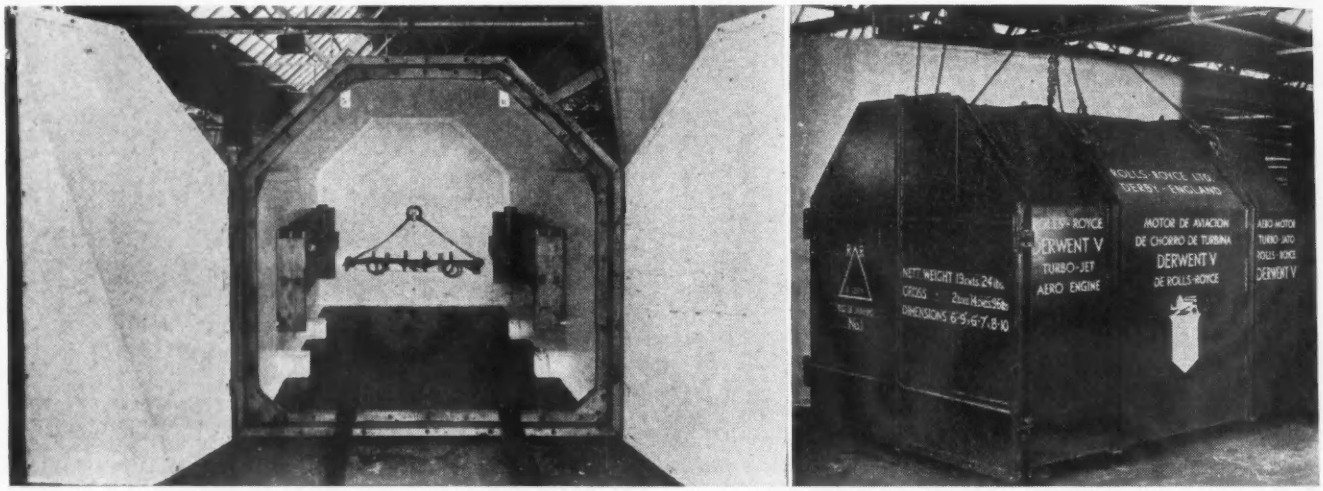
In announcing that Henry M. Swartwood has been appointed director of advertising, the Kaiser-Frazer Corp. has revealed that he will be jointly responsible with Hal Babbitt, director of public relations, and Norris Nash, sales promotion manager, for the combined operations of the company's advertising, public relations and sales promotion departments. Mr. Swartwood was formerly a consultant on advertising and public relations with the Kaiser Co.

ber. Shipments were 11.23 per cent lower in January, with 4,737,098 units, as compared with 5,336,283 in December. Production of truck and bus casings was about one per cent less, with 1,411,967 in January and 1,427,429 in December. Shipments of truck and bus tires were 1,181,928 units, as compared with December shipments of 1,246,362. Both shipments and production of automotive tubes were down slightly from the previous month.

Consumption of rubber by manufacturers increased 1.56 per cent during January, the Rubber Manufacturers

Announce New Silvaire Observer-90

Developed from the basic Silvaire design, the new two-place Silvaire Observer-90, an all-metal, high-wing tandem with a Plexiglas bubble canopy similar to those used on fighter planes, is produced by the Luscombe Airplane Corp., Dallas, Tex. Like other Silvaire models, the new plane features the Luscombe all-metal wing, the Silflex landing gear, and similar advanced design features. It is powered by a 90-hp Continental engine, and has a top speed of 125 mph.



A ROLLS-ROYCE PACKING CASE

Rolls-Royce has built a packing case which is designed to carry a Nene turbo-jet engine on an exhibition tour through South America. Air-tight, of all-steel construction, with joints tested to 1¼ psi, its weight with load is 2½ tons. The engine base is on wheels, and four permanent jacks enable it to be lifted off its wheels while on exhibition. As a further precaution, a balloon fabric cover is put over the engine while in its casing, and is sealed to the base by a sponge rubber joint.

Twin Coach '47 Sales & Net Top Previous Years

Twin Coach Co.'s 1947 sales and earnings were three times greater than in any previous year of the company's history. Sales amounted to $34.5 million, and earnings were $4.54 per share of common stock. The report also reveals that Twin Coach is now the world's largest builder of 30 to 45-passenger gasoline urban motor coaches.

Tire Output Down Slightly In January

Production of automotive casings was off slightly in January from December levels, the Rubber Manufacturers Association disclosed recently. Production of passenger casings declined 2.77 per cent, totaling 6,438,655 units, as against 6,622,352 in December.

Association stated. The use of natural rubber increased to 58,065 long tons during January against 56,284 long tons in December. Synthetic rubber use declined slightly from December's 43,230 long tons to 43,002 for January. Total rubber consumed during January was 101,067 long tons against 99,514 long tons for December.

Oldsmobile Station Wagons Get Fisher Bodies

Production of station wagon bodies for Oldsmobile has started at Fisher Body's Cleveland, O., plant, it was revealed recently by L. C. Goad, GM vice president and general manager of the Fisher Body Div. Production for both Chevrolet and Oldsmobile will be handled by the Cleveland plant until a transfer of operations is made to a new Fisher plant at Euclid, O. now being readied.

L-M Starts Producing At Los Angeles Plant

Formal opening of the new Los Angeles Lincoln-Mercury assembly plant is scheduled for the end of April, although production has actually begun on a very small scale. Production schedules at the end of April call for 50 cars daily. Capacity of the plant is 200 cars a day with a force of 1500 employees.

Argentina Eases Ban on Car Imports

The Argentinian ban on the importation of new automobiles and parts which has been in effect for about six months is being eased slightly. Exchange permits for the importation of automobiles will be granted for 1947 models and for those for previous years.

NEWS *of the* AUTOMOTIVE INDUSTRIES

Boost Driver Convenience in '48 GMC Trucks

New driver comfort and convenience features are being offered on certain models of the 1948 GMC light and medium duty lines, the GMC Truck & Coach Div. of General Motors announced recently. For 1948, all models of the FC-100 and FC-150 series, comprising units of 4600 to 5800 lb GVW, have a new steering column gearshift, a newly-designed foot-operated parking brake, and a redesigned three-speed Synchro-Mesh transmission as standard equipment. Models of the FC-250 and FC-300 designation, and those of the FC, FF-350 series—in GVW ranges of 8800 to 16,000 lb—now have a completely new four-speed Synchro-Mesh transmission which is also optionally available for the FC-100, 150 lines. When installed in these latter units, however, gearshift and parking brake levers are conventionally placed.

Tucker Corp. Purchases Aircooled Motors

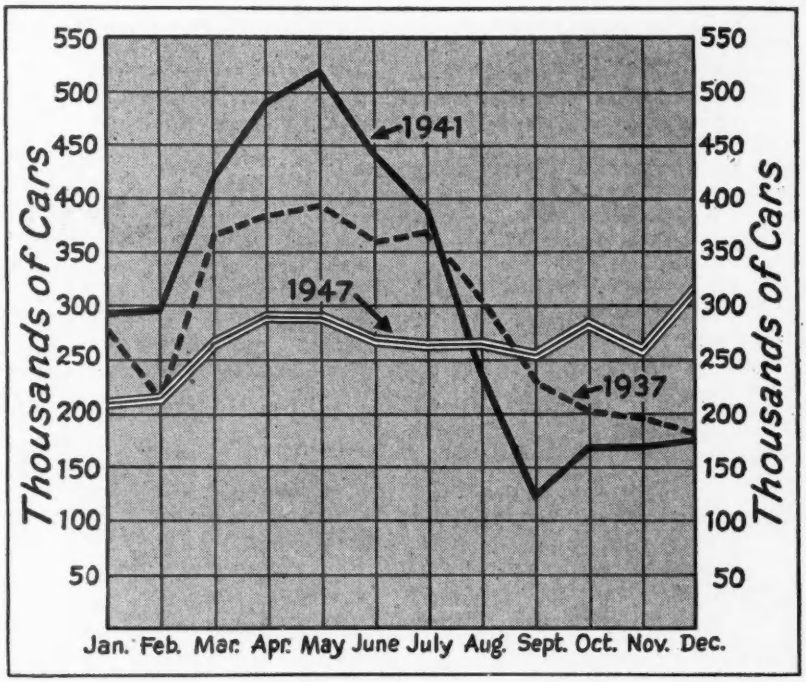
Purchase of Aircooled Motors, Inc. in Syracuse, N. Y. by the Tucker Corp. of Chicago, means that the Syracuse plant, which formerly made only aviation engines, will amplify its business, and expand, according to Carl F. B. Roth, president of Aircooled Motors.

Preston S. Tucker, president, Tucker Corp., has revealed that Aircooled Motors, a subsidiary of the Republic Aviation Co. will be taken over immediately. The purchase price was $1.8 million. In his announcement Mr. Tucker said that he expects to produce 100 engines a day in a few weeks. Aircooled also makes the Franklin aircraft engine, which, it is said, powered 63 per cent of all four-place light planes made in 1947.

Nash Plant in So. Calif. to Operate in Fall

Nash-Kelvinator Corp. expects to have its El Segundo, Calif., plant, in the Los Angeles area, in operation sometime this fall, according to Campbell Wood, plant manager. The company had expected to put it into operation much sooner, but was prevented by the steel situation. Paint baking ovens, conveyor systems, assembly lines and other facilities, are now being installed as rapidly as received from suppliers.

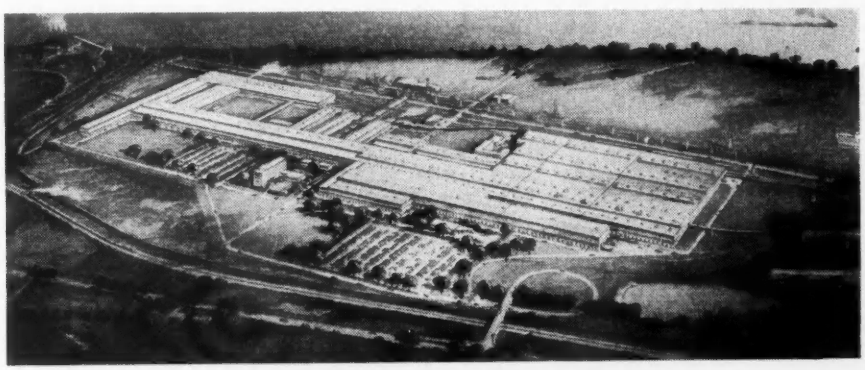
It is planned to assemble both lines of Nash cars, the "600" and Ambassador series. Later a line of trucks, which the company plans to manufacture, will also be assembled here for the western area. The West, in the past, has provided 11 to 15 per cent of the company's total automobile volume. This means that when its capacity production of 250,000 cars a year is achieved, the company will be producing more than 25,000 automobiles annually in the 475,000 sq ft El Segundo plant.



NEW CAR REGISTRATIONS BY MONTHS

WAA Holds Less Than 1000 Surplus Motor Vehicles

Striving to meet a June 30 liquidation deadline, the War Assets Administration reported less than 1000 surplus motor vehicles in its inventories as of Jan. 31, 1948. From 1944 thru Jan. 31, the WAA had sold 509,632 vehicles at a net return to the government of 42 per cent of original acquisition costs.



OF ALUMINUM, FOR ALUMINUM

Over 6,250,000 lb of aluminum are being used by the Aluminum Co. of America in the construction of its new sheet and plate rolling mill in Davenport, Iowa. This giant plant, extending for a mile along the Mississippi River, is reportedly being equipped to turn out the widest aluminum sheet in the world.

NEWS *of the* AUTOMOTIVE INDUSTRIES

New Wright Compound Engine Now in Operation

Designated as the Turbo-Cyclone 18, a new compound aircraft engine, combining the principles of the gas turbine and reciprocating engine, is now in operation in the Wright Aeronautical Corp.'s experimental laboratories. The engine employs three lightweight turbines mounted on the rear of a conventional Cyclone 18 reciprocating engine. Exhaust gas leaving the reciprocating engine at high speed spins the turbines, and the power developed is geared back into the engine crankshaft. It is claimed that this compound engine will reduce fuel consumption as much as 20 per cent over conventional types.

NAVY UTILITY

Designed especially for utility work, this new Navy experimental helicopter, the XHJS-1, built by the Sikorsky Div., United Aircraft Corp., features all metal rotor blades and specially stressed landing gear for shipboard landing. It is powered by a 500-hp Continental engine, and has a top speed of over 110 mph.

Name Richardson President Of Fairchild

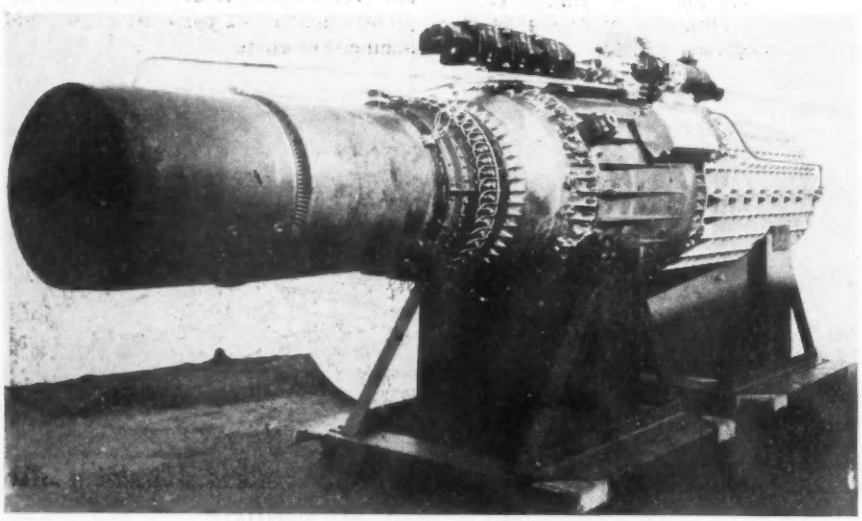
Lawrence B. Richardson, formerly vice president of the Curtiss-Wright Corp., has recently been named president of the Fairchild Engine and Airplane Corp. He succeeds J. Carlton Ward, Jr., who has been elected chairman of the board of directors, and who will continue as chief executive officer.

Ford Modernizes Plant for Automotive Forgings

Ford Motor Co. has set up a completely modernized plant for the mass production of automotive forgings at Canton, O. Adopting new techniques, Ford will produce one million pounds of forgings and 100 automotive parts daily when the plant is operating at capacity. New heating practices have been adopted and hot extrusion forming methods substituted for many ordinary forging hammer or press operations. Three different methods for heating forging blanks are used at Canton: salt baths, induction heating, and controlled atmosphere furnaces.

Knudson Mfg. to Make New Light Car

A new automobile with body design resembling the military jeep, but considerably smaller, has been developed by the Knudson Mfg. & Design Co. Inc., Buffalo, N. Y. Weighing 635 lb, the two-passenger car is a roadster type with a canvas top. Powered by a one-cyl, four-hp engine, the vehicle has an overall length of 90 in. and is 43 in. wide. The engine is mounted in rubber over the rear axle, and there are only two pedal controls: a brake and an accelerator. The company said that the car's top speed is about 40 mph. President James F. Knudson, Jr. stated that the company is planning to put the car on the market for $545, fob, Buffalo.



WRIGHT TO EXPEDITE

A U. S. Air Force contract was recently awarded to the Wright Aeronautical Corp., engine building division of the Curtiss-Wright Corp., to accelerate the development of the Lockheed-designed XJ-37 turbine jet engine. This engine is designed to produce a rated thrust of 5000 lb.

Italian Car Plants Move to Argentina

Under the terms of a recent agreement, the Maserati and Cisitalia automobile plants in Turin, Italy will be moved to Argentina.

Vauxhall Built 61,453 Units in 1947

Production in 1947 of the English Vauxhall Motor Ltd. Co., a GM subsidiary, was 61,453 units: 30,376 passenger cars and 31,077 trucks. This is an increase of 15 per cent over 1946. Exports comprised 59 per cent of the passenger cars and 35 per cent of the trucks. During 1948 the company will be expected to export 75 per cent of its passenger car production and 55 per cent of its trucks. As a result of the new flat rate system of taxation adopted in England, Vauxhall has reduced the number of its passenger car models to four and a six cyl. models.

NEWS *of the* AUTOMOTIVE INDUSTRIES

Boeing Revives Wichita B-29 Operation

An item that may well be placed in the straws in the wind department is the announcement by the Boeing Airplane Co. of the revival of limited activity in the flight hangar and adjacent buildings formerly occupied by Boeing in Wichita, Kans. At the moment, no details or information can be released in connection with the work to be done other than it calls for the modernization of B-29s.

Model New Jet Trainer on P-80 Shooting Star

A new U. S. Air Force training airplane, a two-place jet propelled Shooting Star modelled after its fighter counterpart, the P-80, has passed preliminary flight tests at the Lockheed plant in Burbank, Calif. The new trainer is powered by the same engine, the Allison Model 400, which is used in the latest models of the P-80B. The new trainer has been designated the TF-80C.

Rootes Group Invades the U. S.

Plans are now being completed by the Rootes organization for long-term marketing and servicing in the United States of Hillman passenger cars and the Commer delivery vehicle. Concentration will be on the Hillman-Minx sedan, the convertible coupe and the estate car, together with the Commer light truck. About 500 Hillmans have been shipped from the Coventry factory. Selling prices in the United States have been fixed at $1874 for the passenger cars, and $1825 for the truck. Headquarters of Rootes Motors Inc., for sales, service and parts are in New York City, and a national organization for sales and service is planned.

Willard Completes Plant Expansion in L. A.

The Willard Storage Battery Co. has completed the expansion of its Los Angeles plant. The $350,000 expansion program will give the company an additional production of 250,000 storage batteries a year.

Highway Research Soon on Pennsylvania Turnpike

The Committee on Economics of Motor Vehicle Size and Weight of the Highway Research Board expects to begin its pilot study on the Pennsylvania Turnpike and an alternate parallel route sometime early next month. These road tests, which will take about nine weeks, comprise a vehicle performance study. In addition to obtaining the performance of a few carefully selected test vehicles over actual highway routes, studies will be made to determine the performance of passenger cars and commercial vehicles that normally use the test routes and the volume of traffic over the two routes during the period of the tests.

Gulf Project Studies Gasoline-from-Coal

The Gulf Oil Corp. has launched a research project to study the conversion of coal and natural gas into gasoline. Radioactive isotypes are being applied in the study which is being conducted by Gulf's fellowship at the Mellon Institute in Pittsburgh.

Du Pont Grants Licenses To Make Duco

The Du Pont Co. has announced that it has granted free licenses to 50 paint and lacquer companies for the manufacture of a new type of metallic finish which Du Pont markets as "Duco" Metalli-Chrome lacquer, and that free licenses will be granted to all interested paint and lacquer manufacturers who request them. The licenses provide not only for the use and sale of the lacquer itself, under a product patent, but also for that part of another patent covering the process for its manufacture.

Bureau of Stds. Readying Spark Plug Specs

A new set of specifications for automotive spark plugs is expected to be issued by the National Bureau of Standards within the next few months. They will be submitted to manufacturers for approval before being promulgated. The Bureau has done considerable test work on spark plugs.

Hudson Nets $5,763,352 in 1947

Consolidated net income of $5,763,352 for 1947 was announced recently by the Hudson Motor Car Co., as compared to $2,748,107 for the preceding year. Net sales for 1947 totaled $159,514,330, with unit factory sales totalling 103,301.

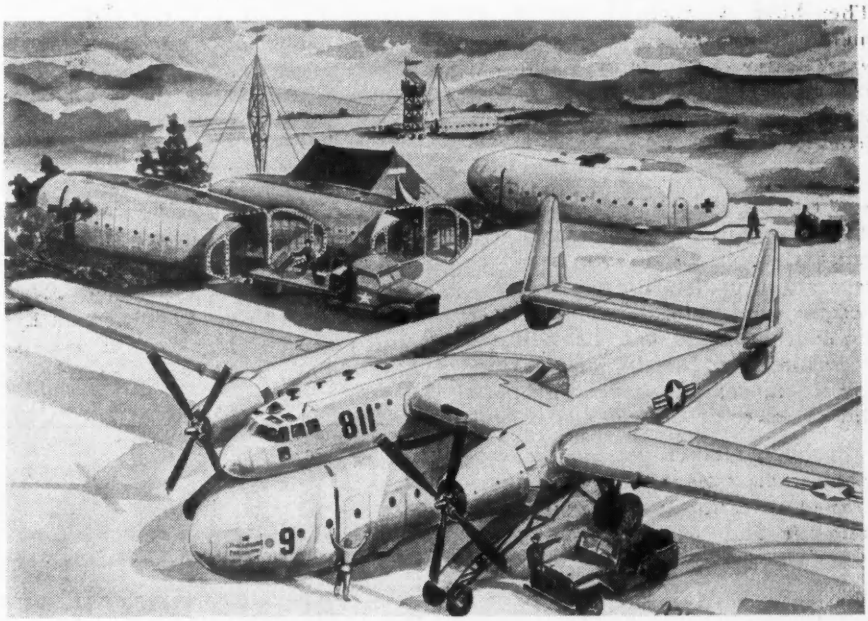
Ship 441 Personal Planes in February

Shipment of 441 personal aircraft by 13 companies during February was announced recently by the Aircraft Industries Association of America. The shipments included 221 four-place planes and 220 two and three-place aircraft, with a total dollar value of $1,869,000 figured at the manufacturers net billing price.

1947 Colwyn Gold Medal to Dr. Dinsmore

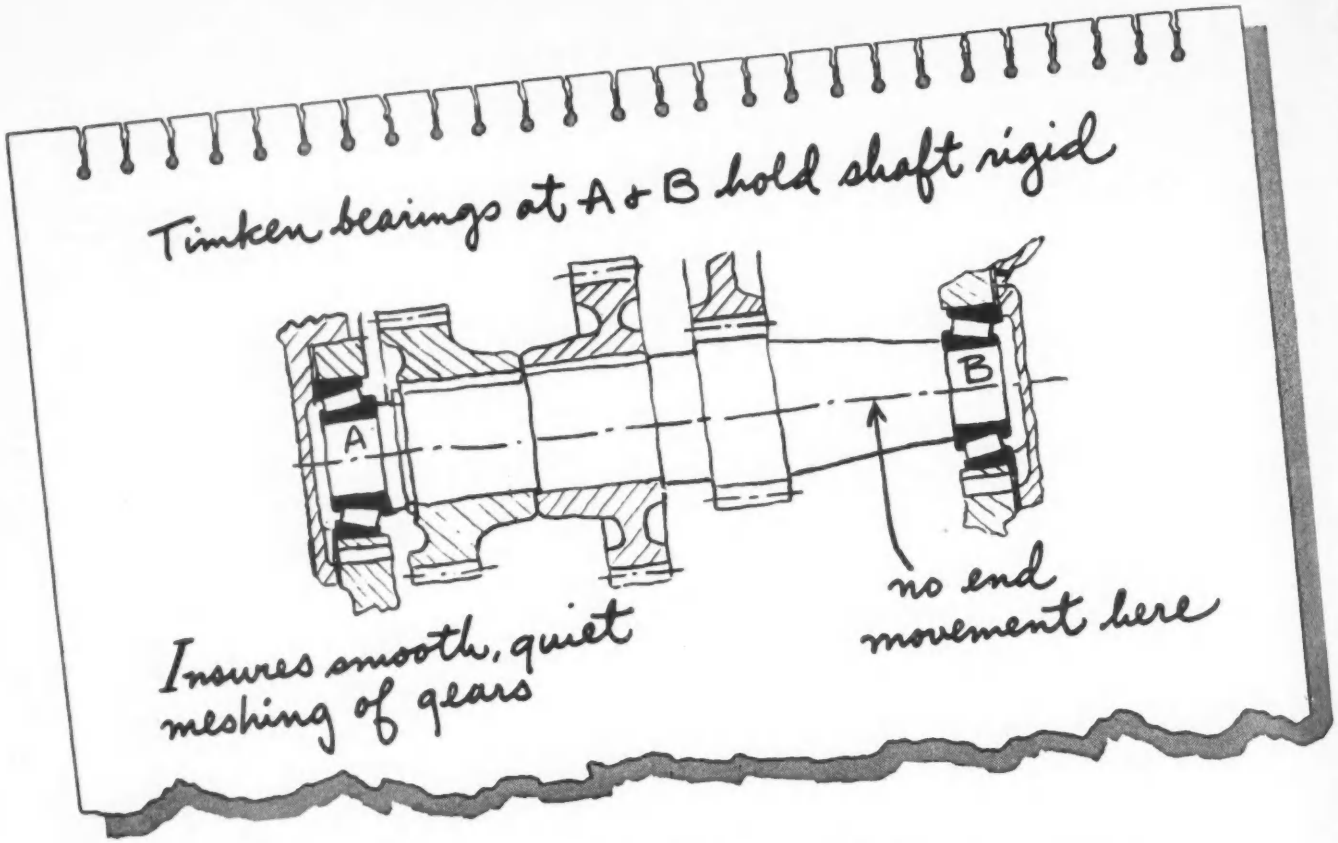
Presentation of the Colwyn Gold Medal for 1947 will be made June 25 in London, England, by the Institution of the Rubber Industry to Dr. Ray P. Dinsmore, vice president in charge of research, Goodyear Tire and Rubber Co., for his work in synthetic rubber research.

(*Turn to page* 92, *please*)



FLYABLE PACKS

To be known as the C-120 Pack-Plane, a detachable fuselage aircraft is now being developed by the Fairchild Engine and Airplane Corp. under an USAF contract. Resembling the Fairchild Packet (C-119), the plane can fly as an air tractor, with or without its fuselage or pack. Designs call for a nine-ton payload capacity with a 2000 mi range.

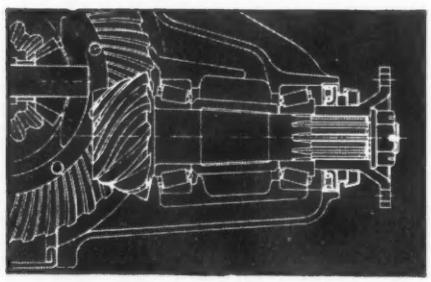


Here's a quieting thought for automatic transmissions

ONE way to eliminate unnecessary noise in your automatic transmission is to use Timken tapered roller bearings on the countershaft. They hold the shaft in rigid alignment, insure smoother meshing of gears. They eliminate deflection and end-movement. There's less chance of wear . . . more years of quiet, trouble-free operation.

Due to their tapered design, Timken bearings carry both radial and thrust loads in any combination. Because they eliminate the need for separate thrust bearings or washers, designs can be simplified. And since Timken bearings can be adjusted permanently at installation, machining tolerances of surrounding parts don't need to be as close.

In short, Timken bearings in automatic transmissions mean (1) smoothness of operation, (2) quietness, (3) long life, and (4) low cost.



LOOK AT PINIONS FOR EXAMPLE... Timken bearing-equipped pinions and ring gears usually outlast the rest of the power train. They have solved the toughest thrust problems on hypoid and helical gears. On wheels, differentials, and steering parts, too, Timken bearings have proved their superiority time and time again.

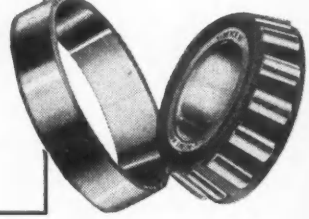
For nearly 50 years, Timken bearings have been first choice in the automotive industry. If you're designing an automatic transmission, feel free to call upon our engineering facilities for help or information about the bearing applications in your design. In Detroit, phone MAdison 1380. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

NOTE TO P.A.'s. *Because every step of the manufacture of Timken bearings is controlled within our company . . . because our vast manufacturing facilities are widely dispersed . . . you will find the Timken Company a supply source of outstanding reliability.*

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◯ AND THRUST →◯← LOADS OR ANY COMBINATION →✳←

X-435 Rubber

Shipments of New Synthetic Product on Way to Tire Companies. Passenger Car Treads Made of It Are Reported to Give 20 to 40 Per Cent Longer Life.

By Karl Rannels
Washington Bureau,
Automotive Industries

WITH the shipment in late February of the first commercial lot of X-435 (ultipara) rubber for tire production, officials of the Office of Rubber Reserve believe they have almost attained a goal sought since 1940 when defense mobilization began. It is the development of a synthetic rubber equal in quality to natural rubber for most general purposes.

All laboratory tests so far, officials told AUTOMOTIVE INDUSTRIES, indicate that use of ultipara for passenger car treads should result in from 20 to 40 per cent longer tire life than natural rubber tires. They emphasize, however, that laboratory tests are not always borne out by actual road tests; these will take from one to two years for a satisfactory conclusion to be made. It also was pointed out that like the many other types of synthetic now in or suitable for bulk production, tests do not indicate that the new X-435 or ultipara is comparable with natural rubber for use in manufacture of truck and bus tires.

Boosting Yearly Output to About 18,000 Tons

Ultipara (the trade name owned by the Copolymer Corp.) is currently produced only in the Reconstruction Finance Corp. plant at Baton Rouge, operated by that company, at a rate of about 1000 tons a month. Additional facilities completed during March will boost Copolymer's production rate to around 1300 tons a month. Other facilities are being converted in the Borger, Texas plant (operated by United States Rubber Co.) which will boost the total production to about 18,000 tons a year. This is sufficient to produce more than a half-million standard-size and type passenger car tires.

"Synthetics have their faults and disadvantages," officials say. "None yet developed have the full elastic qualities of natural rubber; generally, they are not as strong. But it must be remembered that quality of natural rubber has been set by nature; synthetic quality is not fixed but is limited only by the ingenuity of man."

The apparent key to the problem of improving the wearing quality of synthetics lies with the temperature of polymerization. In past practices, synthetics were polymerized at temperatures from 122 F to 128 F. The new ultipara is obtained by polymerizing butadiene and styrene at low temperatures of about 41 F; efforts are now being made to effect polymerization at temperatures even lower, at 14 F and possibly as low as 0 F.

Production Costs Slightly Higher

Low temperature polymerization reaction is carried out in the same manner as the ordinary high temperature reaction except that ultipara requires the addition of speed-up chemicals. These chemicals, which are used in combination, are: Cumene hydroperoxide, an oxidizing agent; invert sugar, a reducing agent; sodium pyrophosphate and ferris sulphate, activating agents. Methanol is used in the butadiene-styrene-water emulsion as an anti-freeze.

Cost of producing the X-435 is estimated at about a quarter-cent a pound more than the ordinary GR-S rubber; it is further estimated, however, that if zero polymerization is attained, such production cost would be perhaps one and one-quarter cents more.

Since the research program was instituted by the ORR in 1941, at least 430 commercial variations of butadiene-styrene have been designated as suitable for wide-scale use and production. Currently, more than 50 of these varieties are in regular production and about 72 per cent of total GR-S production is of the types developed since the Japanese cut off the natural rubber supply early in the war.

While the ultipara process was developed by Copolymer, it will also be made available to other rubber companies for further development and production of the new product. The ORR will assist in converting Government-owned plants to this end.

In addition to the Baton Rouge and Borger plants, there are seven other Government-owned synthetic plants under operation by rubber companies. They are located in Akron (Firestone), Lake Charles, La., (Firestone), Port Neches, Tex., (Goodrich), Houston (Goodyear), Los Angeles (Goodyear), Naugatuck, Conn., (U. S. Rubber), and Baytown (General).

Engineering Library

This is the 1949 Lincoln Cosmopolitan town sedan. Completely new from roof to road, it features a new 152-hp V-8 engine and new suspension, chassis and body.

The 1949 Lincolns

Two Models Feature New Chassis and Bodies, 152-Hp Engine and Independent Front Suspension with Coil Springs

FIRST 1949 cars in the automobile industry, the completely new Lincoln and Lincoln Cosmopolitan models, have been announced by the Lincoln-Mercury Division of the Ford Motor Co. The two models are offered in eight body styles and two separate price ranges.

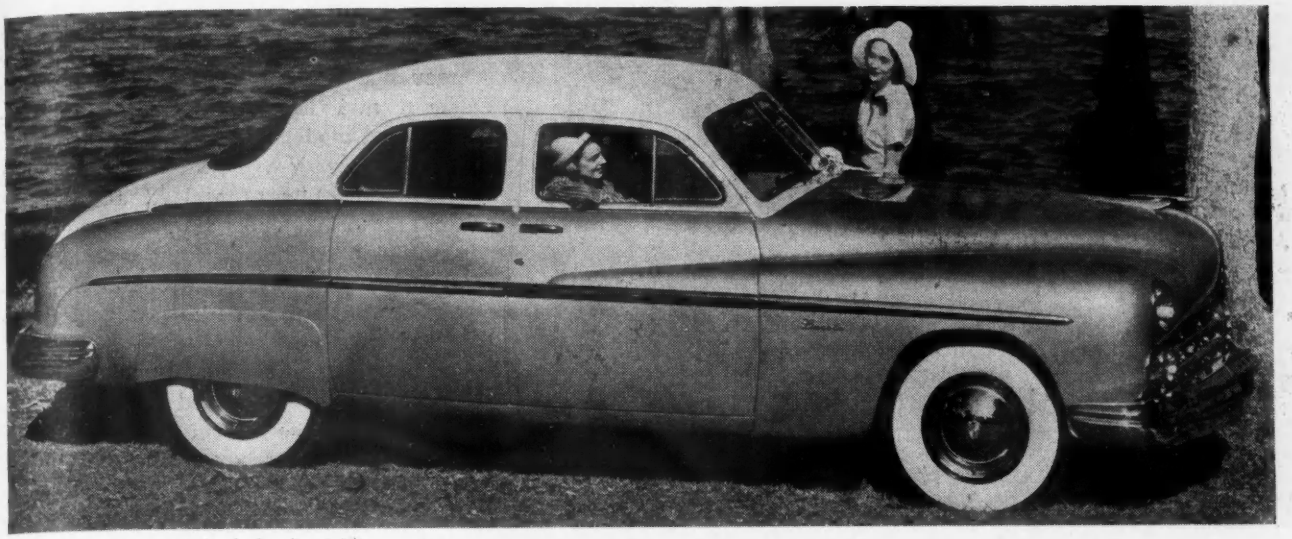
The Lincoln Cosmopolitan has a wheelbase of 125 in; the Lincoln, 121 in. Both are powered by a new 152 hp eight-cylinder V-type engine, largest automobile engine ever produced by Ford.

Bodies are of reinforced all-steel construction with box section sills for maximum rigidity. Upper and rear portions of the rear fenders on the Cosmopolitan are integral with the body. Additional width, with no increase in overall dimensions, has been obtained by building the bodies to nearly full fender width. All doors are triple-sealed against body air leaks. The dash panel and passenger compartment have been

SPECIFICATIONS FOR 1949 LINCOLN AND LINCOLN COSMOPOLITAN MODELS

General:	Cosmopolitan	Lincoln
Wheelbase (in.)	125	121
Drive	Hotchkiss	Hotchkiss
Curb Weight (lb)	4600	4100
Overall length (in.)	220	212.5
Overall width (in.)	78.6	76.5
Height loaded, closed bodies (in.)	62.6	63.5
Tread—front (in.)	58.5	58.5
Tread—rear (in.)	60	60
Axle ratio	4.27:1*	3.9:1 standard 4.27 with overdrive
Tire size	8.20-15	8.20—15
Body Dimensions:		
Front seat width (in.)	59.5	57.1
Inside width of body at center pillar at belt line (in.)	59.3	58.3
Rear seat width (in.)	58.8	60.7
Body shell volume (cu ft)	139	132
Trunk volume (cu ft)	22	25
Windshield width (in.)	57	52.6
Engine:		
Type	V-8 L-head	V-8 L-head
Bore (in.)	3½	3½
Stroke (in.)	4⅜	4⅜
Displacement (cu in.)	337	337
Compression ratio	7.0:1	7.0:1
Horsepower — Maximum	152	152
Torque—maximum (lb-ft)	265	265
Clutch		
Driven disk OD (in.)	10.5	10.5
Driven disk area (sq in.)	96.2	96.2
Brakes:		
Type	Duo-Servo	Duo-Servo
Drum diameter (in.)	12	12
Lining width front (in.)	2¼	2¼
Lining width rear (in.)	2	2
Effective lining area (sq in.)	204	204

* All Cosmopolitans are equipped with overdrive which uses a 4.27 ratio.



Shown here is the new Lincoln sport sedan, featuring long sweeping lines, low overall height and better visibility.

moved four in. forward so that passengers are cradled between the front and rear axles. Seats are wider and more comfortable with coil spring construction and foam rubber cushion lining. Seat movement is hydraulically controlled on the Lincoln convertible and all Cosmopolitan models.

A one-piece, curved glass windshield is used on the Cosmopolitan, while the Lincoln windshield is of the two-pane V-type. Both are nearly six in. wider than the windshields on any previous model. Windows in all Lincoln Cosmopolitan models are operated by hydraulic push-button mechanism. A master control for all windows is located on the driver's door, and an individual control at each window is provided for passengers. Similar equipment is optional on the Lincoln.

Curved instrument panels are designed for maximum safety and visibility. There are no sharp projections. All instruments are located directly in front of the driver for easy reference. They are lighted at nighttime by the "blacklight" method of illumination.

A three-way, fresh air heater of the pressurized type is thermostatically controlled. Fresh air is scooped up under the grille and carried to the heating unit inside the car. The combined effect of the motor-driven blower and forward speed of the car pushes fresh air into the car. In addition, heating in both front and rear compartments is obtained under all conditions. The heater may be operated as a fresh air ventilator during warm weather or, if desired, as a recirculating type heater in cold weather.

Coil springs are provided in front, and longitudinal semi-elliptic permanently-lubricated springs are used at the rear. Spring action is controlled by four direct-action shock absorbers. Both the Lincoln and the Lincoln Cosmopolitan feature the new type superballoon, low-pressure tires mounted on wider rims.

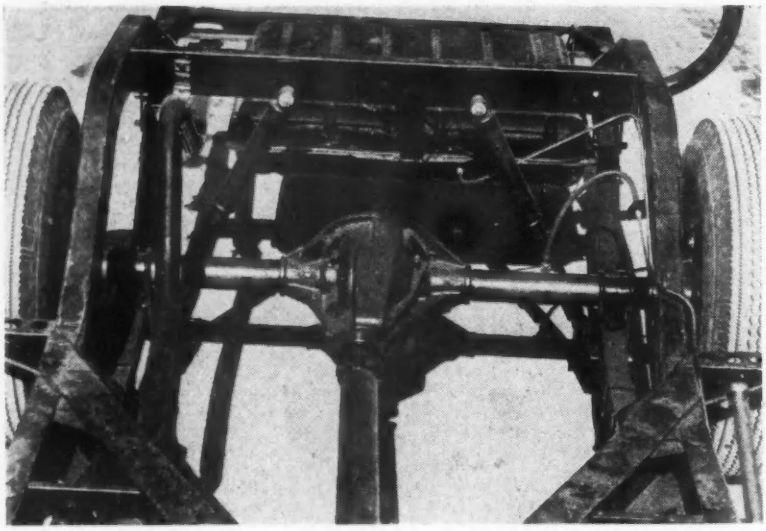
Distinguishing feature of the new Lincoln Cosmopolitan models is this streamlined grille with headlights blending into the body contours.

Tire size is 8:20-15. Body models are available in four body styles. These include a four-door six-passenger town sedan; a four-door six-passenger sport sedan; a six-passenger coupe; and a six-passenger convertible.

New 152-HP Engine

The new V-8 L-head engine has a displacement of 337 cu in., 3½ in. bore, 4⅜ in. stroke, and develops 152 hp. Compression ratio is 7 to 1, and maximum torque is 265 lb-ft.

The new engine features a heavy forged crankshaft with integral counterweights, and triple-layer copper-lead alloy bearings with steel backings. It is equipped with a dual-concentric downdraft carburetor which has an air-cooled fuel chamber. Separate exhaust systems for each bank of cylinders are located out-



Closeup view of Lincoln chassis rear showing rear spring and shock-absorber suspension, and the hypoid drive.

side the engine V. This permits a better arrangement of accessories on top of the engine, and promotes access to valves, distributor and fuel pump.

Cooling has been greatly improved on the new engine. Passage of water through the cylinder blocks has been routed so that all water flows the full length of the blocks from front to rear, returning through the heads to the radiator. Other new features include zero-lash hydraulic valve lifters, and one-piece valve guides for better valve cooling. These are pressed into the block for better heat conductivity. Engine vibration has been reduced by a new viscous-type permanently-sealed vibration damper operating in a silicone fluid.

The possibility of piston slap on cold starts has been reduced by embedding steel struts in the aluminum pistons. These limit piston expansion under various temperature conditions, permitting closer tolerances between piston and cylinder walls. All pistons are equipped with four rings for better oil control.

A vacuum booster pump for uniform windshield wiper operation is standard equipment, and an improved high-capacity generator has been incorporated in all Lincoln and Lincoln Cosmopolitan production models.

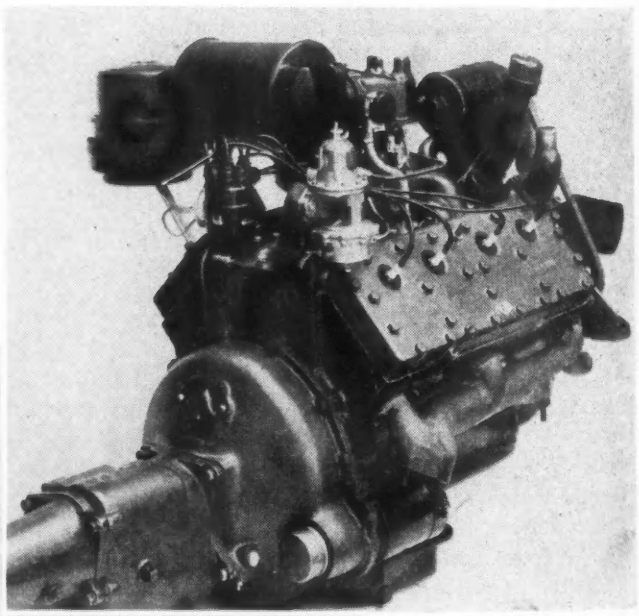
The new V-8 engine is cradled in a K-type frame of welded and riveted construction, consisting of deep channel side members, four cross braces and a heavy channel X member. A reinforced frame is used on convertible models.

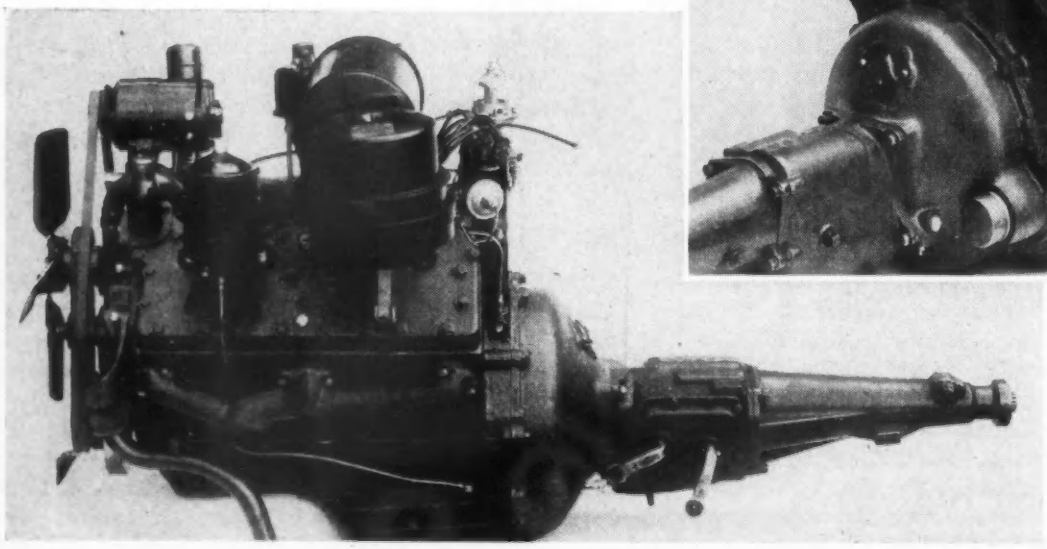
Front coil springs, insulated with rubber, are mounted in wishbone-shaped pressed steel arms. A controlled ride is secured through the application of direct action, telescopic shock absorbers mounted inside the coils. This installation provides protection for the shock absorber and simplifies servicing. The shock absorbers may be removed without jacking up the wheel or interfering with wheel alignment. A simplified front roll stabilator is provided. This connects directly to the spindle support and has no links to wear or rattle.

The new models incorporate improved steering geometry, and Hotchkiss drive with auxiliary bumper and hypoid gears. This latter feature has enabled Lincoln engineers to lower the car appreciably without sacrificing passenger comfort.

Brakes are of the duo-servo type and are self-energizing. The rear axle also is new. A semi-float-

(*Turn to page 74, please*)





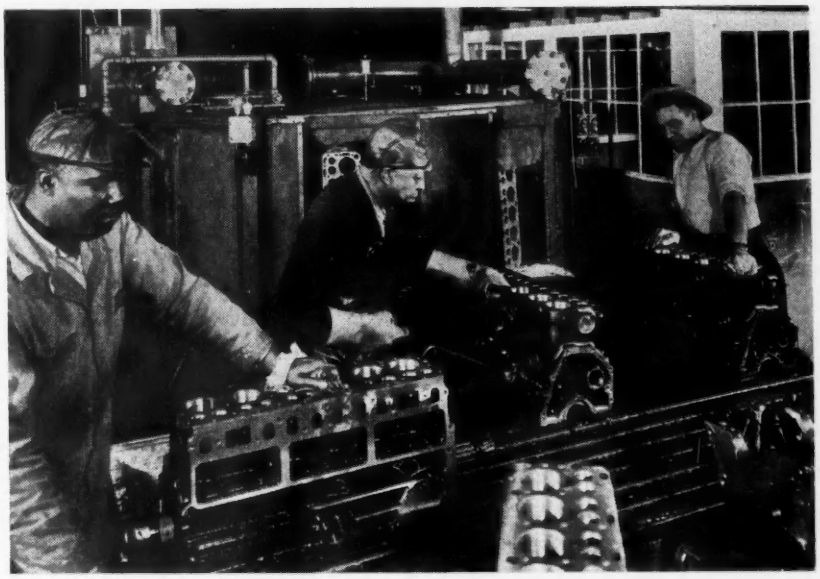
Two views of the new 152-hp V-8 engine in 1949 Lincoln models. (Lower left) Full left side view. (Upper right) Rear three-quarter view of Lincoln's new engine.

A Washing Machine for Cylinder Blocks

AN INNOVATION of unusual merit found on the Ford Six cylinder block machine line is a compact cylindrically shaped washing machine designed and built by Ford engineering. This unit is about 108 in. in diameter, and is fitted with a rotary indexing table which accommodates 13 blocks at a time. Because of its relatively small size it has been possible to install the unit directly at the bend of the gravity roller conveyor at the end of the machine line.

More effective cleaning in addition to space saving, is an advantage derived. At certain stations within the machine series of jets are positioned in such fashion as to clean the bores, the oil lines, and bearing lines. There are also jets arranged to sweep the water jacket passages thoroughly to remove sand particles that may have remained after cleaning in the foundry.

The various jets are fed by pressure lines from the central pump system of the machine, which carry a hot soda ash cleaning solution under a pressure of 40 psi.



A view of the new compact cylinderblock washing machine installed on the six-cylinder block line at the Ford River Rouge plant.

New Method for Fabricating Coil Springs

PROFITING by the experience of the industry in the fabrication of front suspension coil springs, the Ford Motor Co. has perfected a simplified procedure for which some outstanding advantages are claimed. The following comments are based upon the set-up expected to be in operation at Hamilton, Ohio about the time this article is published.

In the first place, the present availability of accurately drawn bars, with good surface finish and controlled dimensional tolerances, makes it possible to process the 13-ft bars of spring steel without recourse to centerless grinding. Consequently, as the bars are straightened they go directly to a heating furnace, provided with a chain conveyor feed, where one end is heated to 1700-1800 F in preparation for tapering. The end tapering is done in an Ajax rolling machine with a squeezer attachment, rolls and dies.

The entire bar then is heated to 1775 F in a furnace with a walking beam conveyor and is transferred directly into a Gogan coiling machine. Since the design of the coil spring permits coiling in a single setting, advantage is taken of the heat remaining in the bar after coiling to quench in oil directly from the coiling machine. This operation is handled in an 8-station quenching machine fitted with the necessary holding fixtures, an oil cooling system and essential accessories.

This operation is followed by drawing at 900 F for 80 minutes in a gas furnace. Now the coil springs are shot-peened all over to raise the endurance limit. It is done in an American Wheelabrator machine.

Several controlling inspection operations are made at this stage. First of all there is a sampling inspection—a stated percentage of the run—of Brinell hardness readings to assure conformity with specifications. In addition each spring is fully compressed to solid height to afford a check on dimensional tolerances and maximum load carrying ability.

The final operation is an excellent example of how essential process stages may be combined in the interest of cost economy. At this point the springs are transported through a dip tank for the paint coating and are baked in an oven at 450 F for one hour. At the same time, the selection of the proper enamel and baking temperature provides the right conditions for stress-relief of the springs. Thus one operation takes care of painting, baking, and stress relief.

Vehicle Vibration Limits To Fit The Passenger

By R. N. Janeway, Head
Dynamics Research Department
Chrysler Corp.

CORRELATION of the available data relating to human tolerance of vertical sinusoidal vibration has revealed both the characteristics of vibration and their quantitative values which define constant human sensation levels. The entire frequency range of vehicle vibration, from one to 60 cps can be divided into three zones, in each of which a different characteristic of vibration prevails in determining the human reaction.

Definite safe limits for comfort are recommended and these may be summarized in the following simple relationships: where f = frequency,cps a = displacement (amplitude) in

Low Frequency Range, f = one to six

Constant maximum "jerk" limit: $af^3 = 2$

("jerk", rate of acceleration change)

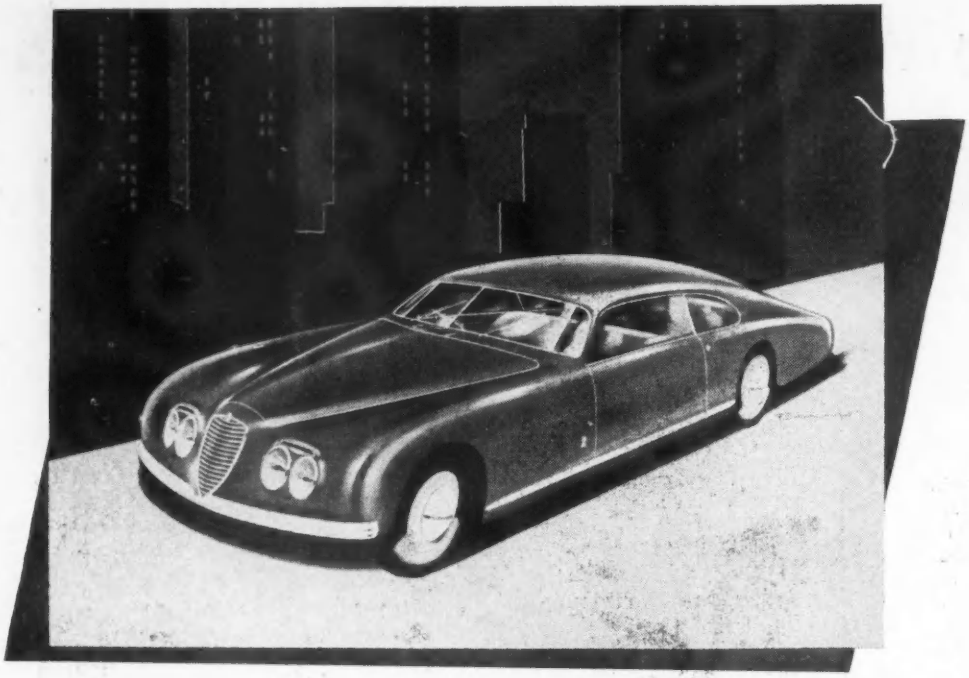
Middle Frequency Range, f = six to 20

Constant maximum acceleration limit: $af^2 = 1/3$

High Frequency Range, f = 20 to 60

Constant maximum velocity limit: $af = 1/60$

Application to vehicle design shows that the best current practice already conforms with the low frequency limit, but does not as generally meet the more difficult higher frequency requirements.



This special body on an Alfa Romeo chassis was designed expressly for Jack Warner, Hollywood, by Pinin Farina of Torino, Italy

Europe's

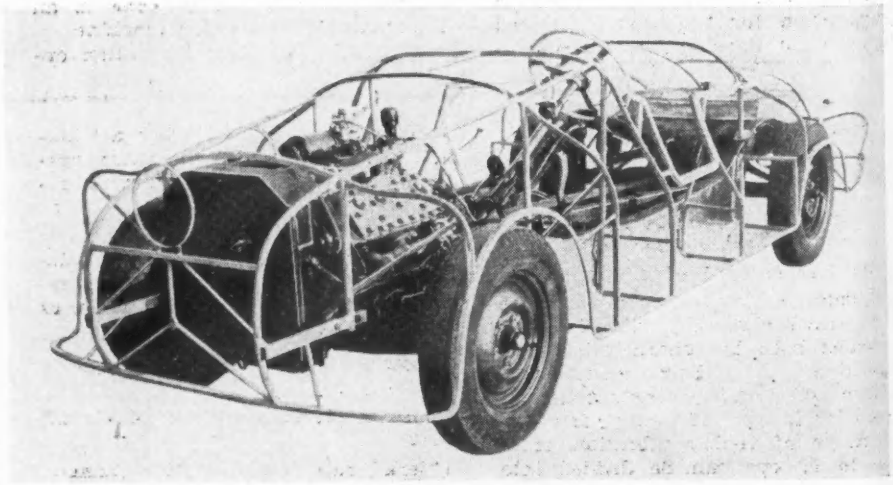
By Eugene Gonda

Special to *Automotive Industries*

GENEVA—The 18th International Automobile Show of Geneva, held in the enormous Exposition Palace March 11-21, was the largest in Europe since before the war. The opening was preceded by a banquet in honor of Enrico Celio, president of the Swiss confederation, at which guests included organizers of the show, numerous government and local authorities, automobile officials and members of the press.

The President of the Organization Committee of the Show, Mr. Dechevrens, seized the occasion to present to President Celio, who also is in charge of Swiss transports and communications, a veritable dossier of complaints of automobile manufacturers and users. In response, President Celio remarked:

(Above) Exhibited at the 18th International Automobile Show at Geneva was the Gatford Aero Coupe from Holland, featuring a sliding transparent top. The car is built chiefly of Ford parts, with duraluminum body panels



Chassis and frame of the Gatford, showing the rigid steel frame. The engine is a 120-hp V-8 with two carburetors. Suspension is by transverse leaf springs with double-acting hydraulic shock absorbers both front and rear. Wheelbase is 108½ in., and an overdrive axle is provided

Largest Automobile Show

Geneva Is Host to More Than 400 Exhibitors from 10 countries at 18th International Salon

"What country is as happy as ours? The President of the Confederation is invited to inaugurate a great manifestation and the occasion is seized to criticize the government. And the orator who presents the complaints runs no risk whatever of making the acquaintance of the jails of the state. How sane this is, how democratic, how Swiss! True democracy presupposes liberty, true liberty, the right of the people to express their opinions. We are there and we want to stay there."

These words, spoken by a Chief of State 24 hours after the suicide of Jan Masaryk, brought a burst of applause from the international group attending the banquet.

More than 400 exhibitors from 10 countries displayed 73 different makes of automobiles, 96 makes of motorcycles and bicycles, 170 makes of accessories, gasoline, tires, etc., 15 makes of bodies and a dozen of trucks of all kinds and sizes. The show was larger than that held in Paris last year or the one in Brussels several weeks ago.

Another interesting detail—and a rare one in Europe these days—was this: for every foreigner who came to the show the entry ticket replaced the Swiss passport visa and all other official papers for duration of the exposition.

Here are the principal makes of automobiles on display:

Great Britain—Healey, Morris, M.G., Riley, Woolseley, Austin, Jaguar, Singer, Triumph, Standard, Vauxhall, Bristol, Frazer-Nash, Daimler, Hillman, Humbert, Sunbeam, Armstrong-Siddeley, Rolls Royce, Bentley, Alvis, Rover, Invicta, Jowett, Lanchester.

United States—Hudson, De Soto, Packard, Buick, Chevrolet, Oldsmobile, Pontiac, Kaiser, Frazer, Ford, Lincoln, Mercury, Willys Overland, Universal Jeep, Dodge, Studebaker, Chrysler, Plymouth.

France—Simca, Delahaye, Delage, Renault, Peugeot, Citroen, Rovin, Talbot, Panhard, Hotchkiss, Julien, Bugatti, Salmson, Dolo, Boitel, Claveau.

Italy—Fiat, Isotta-Fraschini, Lancia, Alfa-Romeo, Cisitalia, Cemsa-Caproni, Maseratti, Moretti, Fimer.

Netherlands—Gatford.

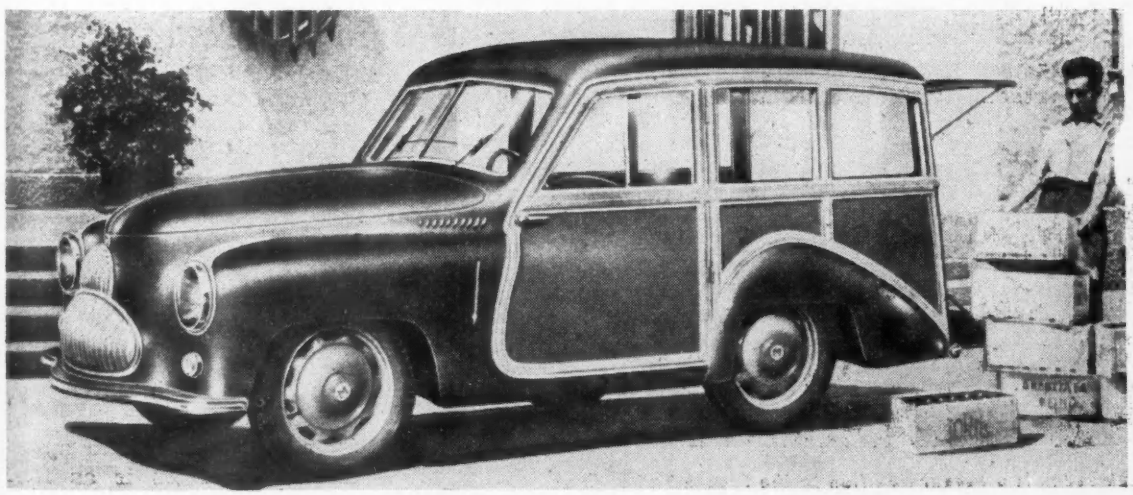
Czechoslovakia—Tatra, Skoda, Aero-Minor.

Germany—Opel.

In general there was no revolutionary design in the automobile industry in 1948. This vast salon was a repetition on a greater scale of all the auto shows of 1947. There were, of course, a few exceptions. The chasm which for years has separated American automobile production from European needs is still far from being bridged.

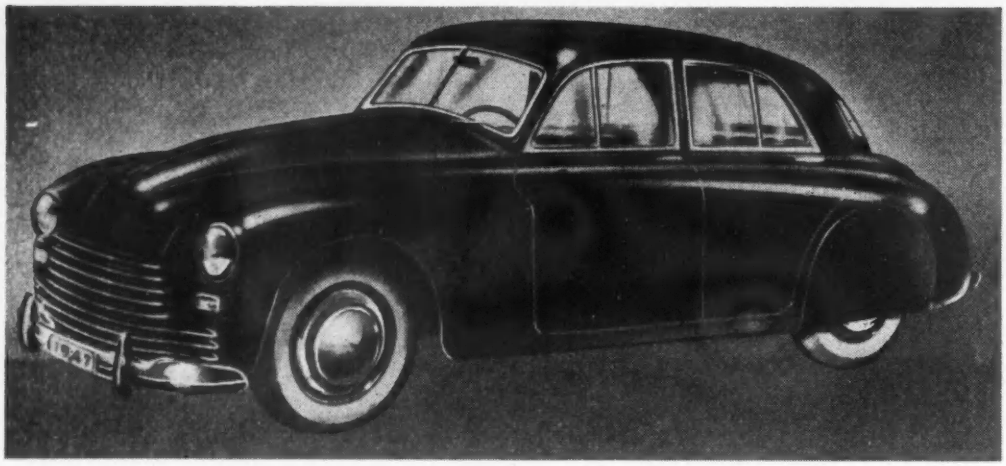
America continues to produce magnificent and enormous automobiles, rarely as low as 14 hp (European rating), sometimes of 18 hp and more often of 20 hp or higher. But the European market needs the small cars that its production resources, theoretically, are capable of making, although in reality this does not hold true for mass production.

Only Britain is making a considerable effort in this regard with small cars like the Morris, Austin, Standard, Hillman, etc. But success has not yet equalled the British efforts—which are assisted by substantial governmental subsidies, because of the price

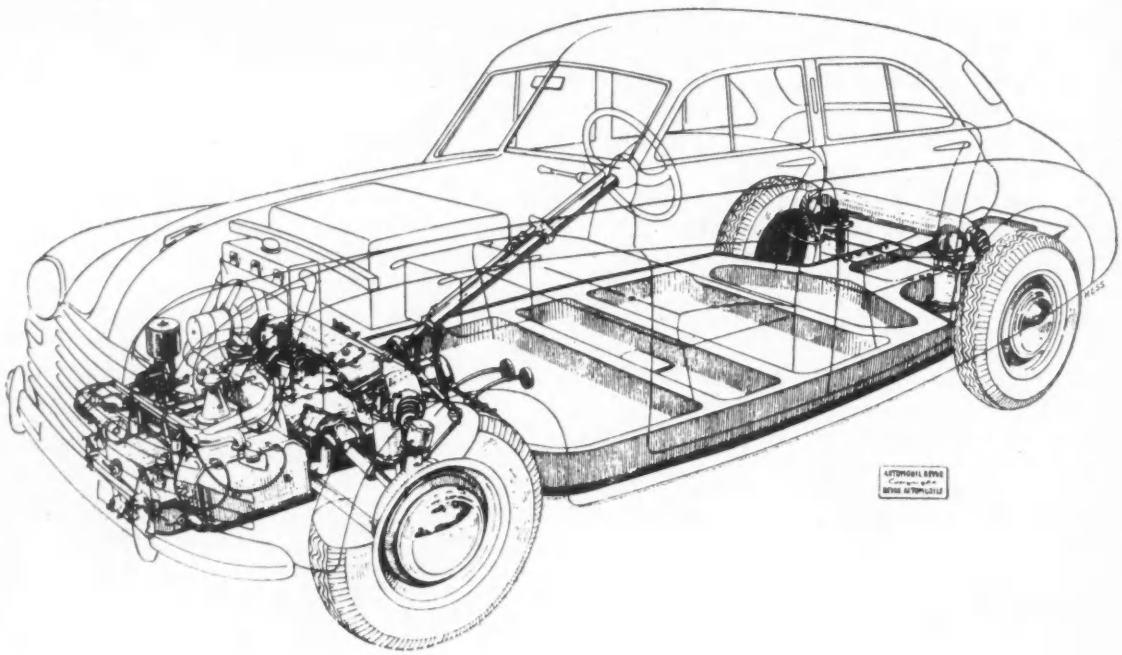


Commercial version of the Italian Moretti

Engineering Library



The Italian Cemsa Caproni, shown in this photo and drawing, has a horizontally opposed four-cylinde engine which develops 40 hp at 4400 rpm, and independent suspension on all four wheels

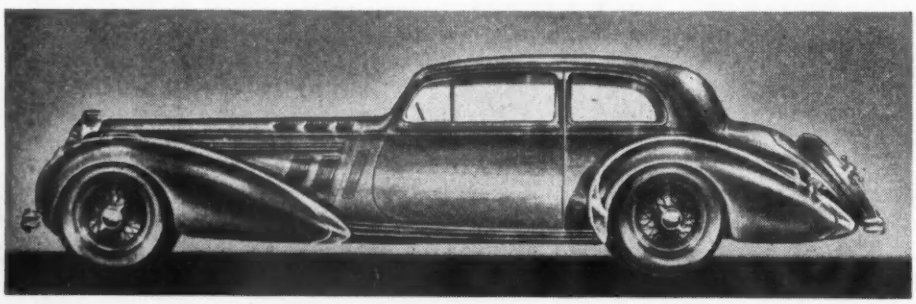


question.

All Europe eagerly awaits the new results of the powerful American automobile industry, buyers and producers alike, but it must be said honestly that European hopes have not yet been fulfilled. The American producers, despite their desire to export, work for the American public and conceive their handsome cars in conformity with American conditions. So far there are no real American innovations apart from some esthetic body embellishments. Furthermore, the American cars continue to be constructed for the long, straight and wide American roads, and not for the more complicated European road system.

American cars consume a great deal of gasoline by European standards and cost too much for the majority of European purses. While their lines are graceful, they are not altogether in accord with European tastes, and their supple suspension systems are not altogether suited to the inferior European roads. These criticisms have even been made regarding a car as economical and inexpensive as the marvelous little Ford-Anglia. Under present conditions only the relatively few rich people of Europe, of whom the majority are Swiss, are able to buy American cars.

Broadly speaking, the situation of the European automobile producers is as fol-



This sleek sedan is a recent addition to the French Talbot line

lows: The British are making an all-out effort, but their prices are still very high. French production of small cars (Renault, Peugeot, etc.) has been completely reorganized following the damages suffered during the war, but operates at only 50 per cent of its potential. For aside from currency troubles which hamper French exports, France lacks raw materials—coal and steel. The efforts of the Italians remain purely qualitative, but from this point of view they are making laudable progress.

Nevertheless, this auto show brought to light several technical innovations, including several excellent two-cycle and four-cycle motors with improved cooling systems. Also different methods of rectification have been introduced with the result that the time necessary for breaking in a motor has been reduced and the lasting qualities of the various parts have been improved.

One innovation at the show attracted considerable attention. The British Invicta car presented a chassis with a hydrokinetic torque converter for the transmission. This eliminates gear shifting by a centrifugal pump which activates a miniature turbine coupled to the transmission shaft. Reverse is accomplished by an epicyclic gear. This transmission is a modified Brockhouse.

Several Italian cars were truly marvels of the body construction industry. The engineer Rapi who works for the Cisitalia and Isotta-Franschini firms is a veritable Leonardo da Vinci of the Renaissance of the Italian automobile. Unfortunately the high price and probably the lack of raw materials is preventing Italian production from achieving a success commensurate with the quality of the cars turned out.

The tiny French cars, Dolo, Rovin, Boitel and Claveau, are excellent little vehicles of three or four hp but they still cost too much for the French people (between 150,000 and 200,000 French francs) and for foreigners, especially for the Swiss with their mountainous country, they are merely playthings and not cars for ordinary use.

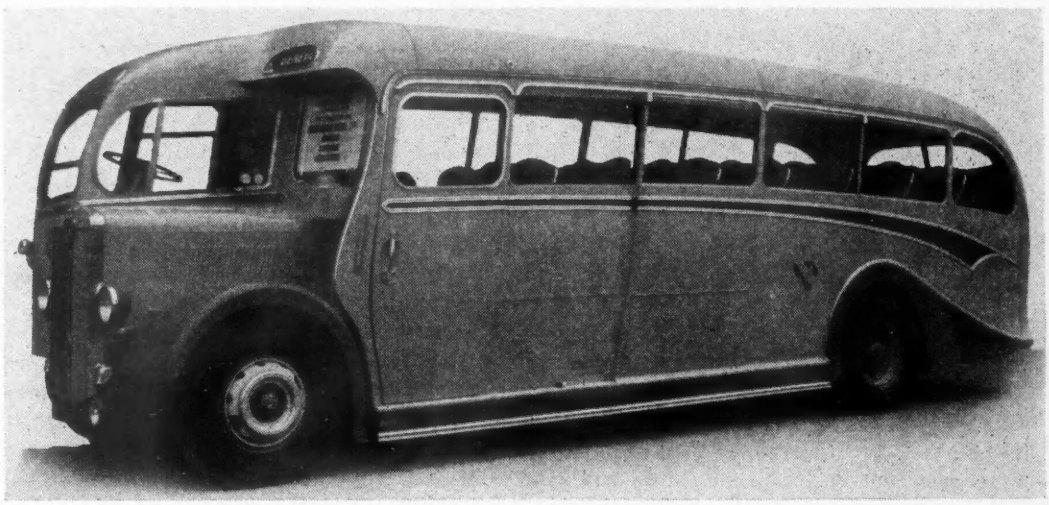
A similar criticism has been made regarding the new four hp Renault with the engine at the rear, which costs some 6000 Swiss francs, a price that is considered a little too high in this country. The prices of the different passenger automobiles vary from about 6000 or 6500 to 75,000 Swiss francs.

In the section reserved for trucks, the good-looking Chevrolet, Dodge, Fargo-Chrysler, Ford and Studebaker productions stood out along with the traditional French Latil, Renault and Chenard and Walker trucks and the robust Swiss Berna and Saurer.

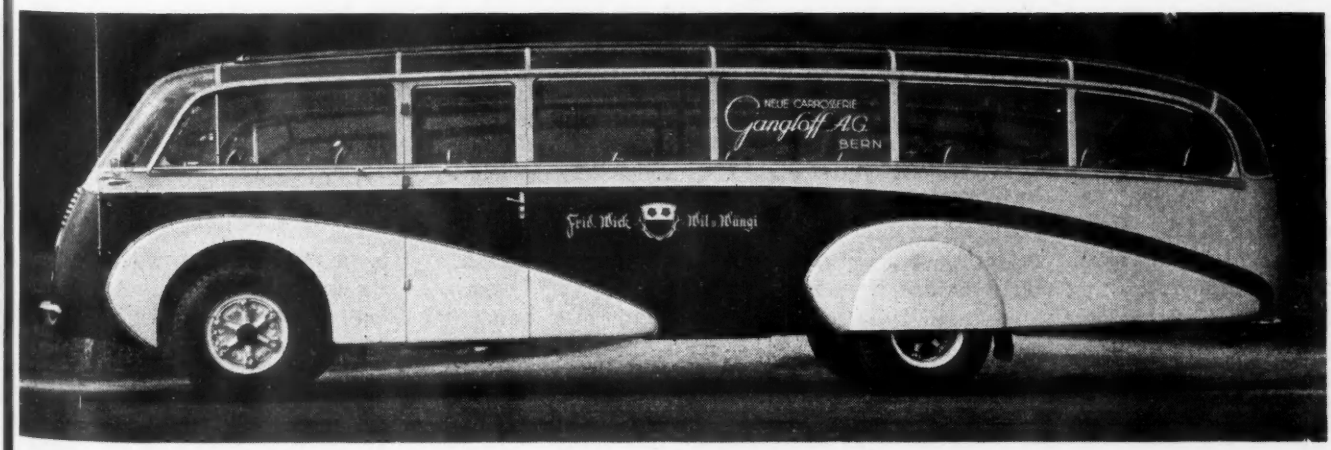
The only Netherlands car at the show, the Gatford, was more a curiosity than a piece of merchandise. It is an enormous sport car of 19.94 hp, eight cylinders, four places covered with a top of what is called "plexiflexe." It costs 25,000 Swiss francs.

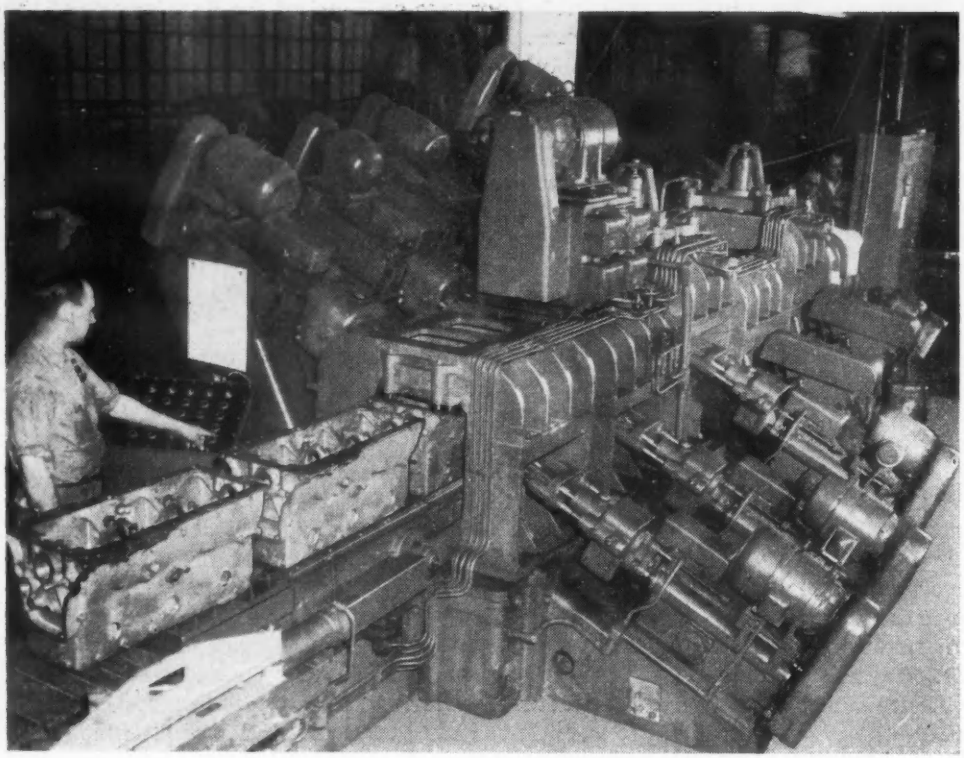
(*Turn to page* 82; *please*)

(Right) British Maudslay bus is powered by six-cylinder Diesel engine developing 100 hp at 1800 rpm



(Below) Bern Diesle-engine bus is made by Swiss. It has eight-speed transmission, and can seat 30 passengers





Multiple-head W. F. & John Barnes drilling machine on the six-cylinder block. It takes most of the angular holes in the block with the block resting on the head. This is an automatic transfer type machine.

Hudson Realigns Facilities for New Six-Cylinder Engine

By Joseph Geschelin

INTRODUCTION of the largest and most powerful six-cylinder passenger car engine ever built by Hudson was marked by realignment of the entire engine department. The cylinder block machining department, new in every respect, features equipment of advanced design, with many of the machines in this category being of the self-contained transfer type.

Hudson has always prided itself on the quality of workmanship that goes into its power plant. For instance, the cylinder bores, in a widely spaced sequence, are rough-bored, semi-finish-bored, finish reamed and then given two separate honing operations: rough and finish-hone. After honing, the bores are inspected for size with a Sheffield Precisionair gage and marked according to code for selective fitting of piston and rod assemblies. Each of the Barnesdrill honing machines has been fitted with the Barnesdrill automatic magnetic-type coolant filter and separator which removes the finest metallic and abrasive particles, thus giving further assurance of fine surface finish.

Near the end of the machine line is a new Natco unit for finish-boring the camshaft bearings and the crankshaft bearing bores. This is a basic operation at Hudson since the bore then determines the selective fitting of precision main bearing shells. Finished bores are sized by means of a Sheffield Precisionair gage and marked according to code. Later on, at the assembly of the crankshaft, the crankshaft journals, which have been previously sized and coded, are used in combination with bearing bores to determine the thickness of the bearing shell at each bearing. This procedure, although an item of added expense, avoids either tight or loose bearing fits and assures the maintenance of a standard clearance.

In the portion of the line concerned with boring and reaming and finishing the valve and guide set-up, there is a battery of Hall eccentric valve seat grinders. These finish the valve seats to specified tolerances and eliminate the usual valve fitting and grinding operations at assembly.

For the initial phases of assembly—the installation of the crankshaft and main bearings, fitting of piston and rod assemblies and assembly of the valve train—engines are moved from station to station by hand on

a gravity roller conveyor. This permits the initial assembly to be paced entirely by the time it takes the crew to do a good job on its part of the assembly. The power conveyor is used only toward the end of the line where the pan, head and accessories are installed.

Hudson is now installing another outstanding feature on the assembly line. At the junction of the initial assembly lines for the six and eight, and before the motors are transferred to the common power driven final assembly line, there will be a new Gisholt Dynetric balancing machine designed to give a final dynamic balance of the engine assembly. Integral drilling units are a part of the set-up, permitting the drilling of balance holes either at the front or at the rear or at both ends.

Just before engines are shifted onto the power-driven conveyor line, they move into a trunnion type roll-over fixture where they are spun several times to make sure there are no loose parts such as washers or fastenings left in the assembly.

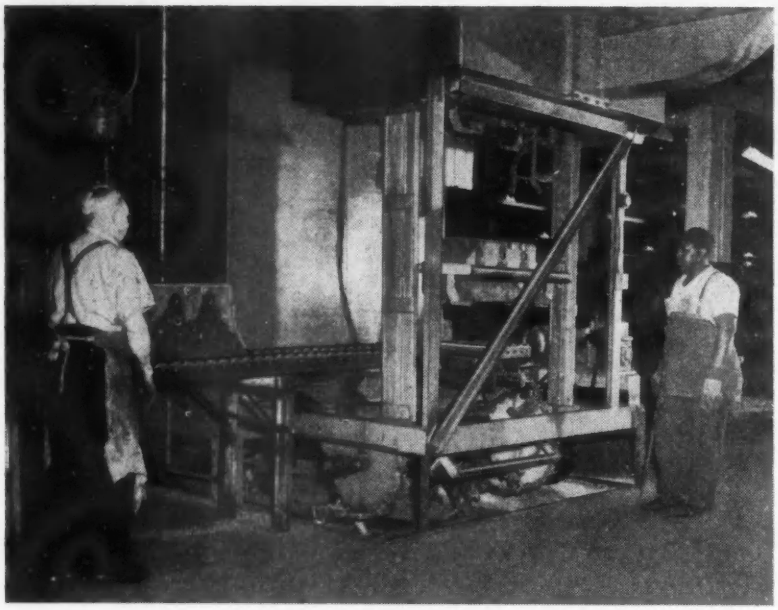
The crankshaft machining line is entirely new and features the most advanced types of turning machines offered by LeBlond. Also of interest is a massive Fitchburg milling machine, used for milling locating spots on the crankshaft forging, the entire operation being done in one setting. Unique feature is the use of cemented-carbide tipped milling cutters, ground with negative rake, which permit heavy metal removal at the rate of about 425 fpm. The chips thus removed are hot and glowing.

The cylinder block machining line combines rebuilt and retooled machines with numerous items of new equipment. At the beginning of the machine line—Operation 10—is the rough-boring of cylinder bores in a massive six-spindle Moline boring machine. Owing to the large diameter of the boring bars—to assure rigidity—they are spaced to take alternate bores. The fixture, therefore, holds two blocks at a time and each cycle completes one block. At the completion of this operation the operator explores each bore with a magnetic gage to check for adequate cylinder wall thickness.

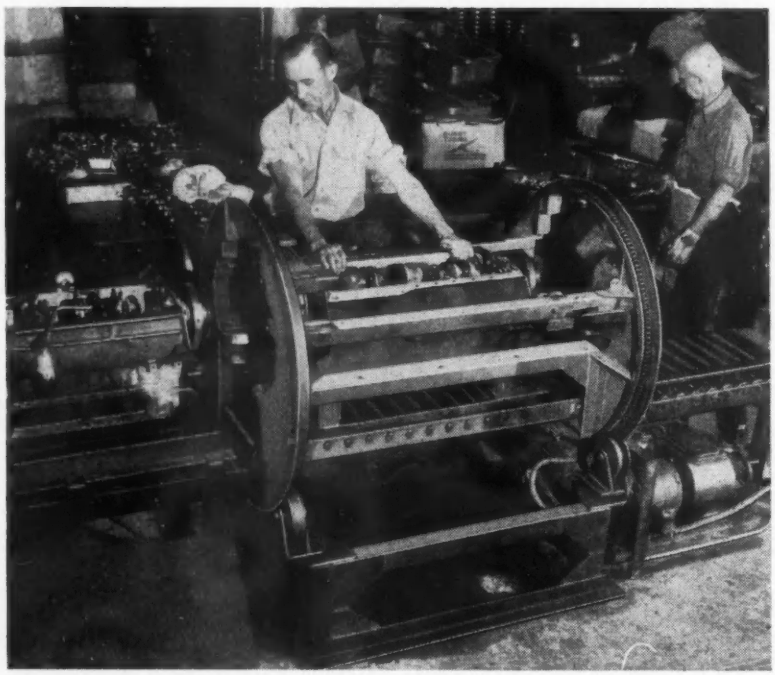
Next in line are the latest type Ingersoll mills: one for straddle-milling of bearing bosses; the other for milling a variety of bosses and pads in angular positions. Then follows a group of four, big three-way Baush drilling machines. The first machine drills 27 holes in the top, 22 holes in the front end, and drills and counterbores 16 holes in the rear end. The second taps 21 holes in the top, 20 holes in the front end, and ten holes in the rear end. The block is then rolled over with pan face up for drilling and tapping from the bottom side. Next, 35 holes are drilled in the pan face; 21 holes in the valve side; and 10 holes in the distributor side. The fourth Baush then taps the same holes. This is followed by the drilling of a variety of oil feed holes and oil holes in a new Foote-Burt drill press.

Finish-boring of cam and crank line bores is done in this two-way Natco machine built for the new Hudson six-cylinder engine. Gaging and coding of crank bores is done at the station at the left, using a Sheffield Precisionair gage

This is the two-way, multiple-station, automatic transfer type machine made by Natco for boring the cam and crank lines. The block is fed in side-wise as shown



Centri-Spray washing machine for cleaning six-cylinder blocks. The block is pushed to the washer on the gravity roller conveyor and is picked up by the fixture mounted on the washer conveyor



Before either the eight or six sub-assembly is routed to engine final assembly, it passes through the roll-over fixture shown here. The operator then rolls the entire unit to permit loose fastenings or other parts, which may have been left in the assembly accidentally, to drop out

Operation 30 in the sequence is the semi-finish boring of cylinder bores in another of the big six-spindle Moline boring machines. This diameter is held to 3.542-3.544 in. Operation 51 covers the assembly of dowels and main bearing caps in preparation for succeeding operations.

For Operation 53, a two-way, 12-station tunnel-type Natco transfer machine is used for finish-boring the camshaft hole, counterboring the camshaft hole in the rear end, semi-finish-boring of the crankshaft holes, and chamfering both sides of the thrust bearing. Another new Ingersoll milling machine follows for milling the oil slinger and oil seal groove in the rear bearing, and finish-milling the faces of the No. 3 thrust bearing.

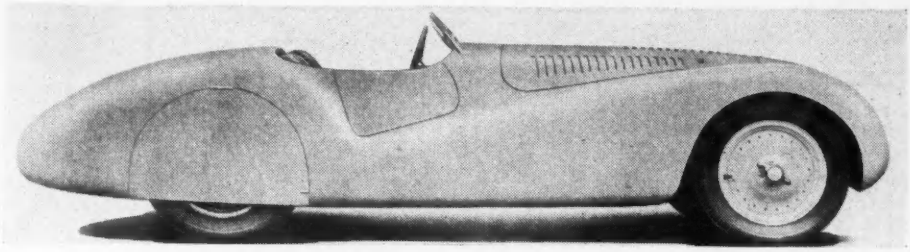
One of the outstanding of the transfer type machines in this line is the W. F. & John Barnes six-station multiple-spindle drilling machine set-up for the following operations:

Drill, counterbore, countersink, and semi-finish drill distributor hole
Drill, chamfer, and semi-finish ream oil pump shaft hole, finish pad
Drill, tap distributor mounting hole
Drill and tap three distributor mounting holes
Drill, tap three distributor holes
Drill and ream oil filler hole
Countersink distributor and oil pump mount holes
Drill one 5/8 in. hole, 1 1/8 in. deep

Cylinder bores next are finish-reamed, one at a time in single spindle boring machine set-ups. The block is then rolled over to get the pan face down, and goes through the two honing operations—rough-hone and finish hone—in a group of two Barnesdrill honing machines fitted with Micromatic honing tools. Finish honed bore size is held to 3.562-3.564 in. in diameter, inspected 100 per cent and gaged by means of the Sheffield Precisionair gage for size, roundness, taper and surface finish. Each bore is marked for size according to code to guide the selective fitting of piston and rod assemblies later on. Blocks are burred, blown-off and washed, valve guides are installed in a Hannifin air press, cam bearings are pressed in, and the block is water tested for the second time in preparation for the final machining operations.

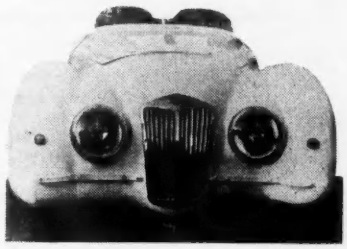
Earlier in the sequence the cam and crank lines were bored in a special two-way Natco tunnel type transfer machine having 12 working stations and holding 16 blocks at a time. At this later stage, blocks go into another big Natco unit for finish-boring the cam line—this time boring the pressed-in babbitt bearings—and finish-boring the crank line. At the same time, the oil pump and distributor holes are finish-bored. At this station an operator gages the main bearing bores with a Sheffield Precisionair gage and marks each bore with a suitable code. This serves later on for selecting the proper thickness of precision bearing insert to match the mating crank journal.

During the trip along the machine line, the block was moved from one side to another, and rode alternately on its top and bottom surfaces. Near the end of the line the block is (*Turn to page 72; please*)

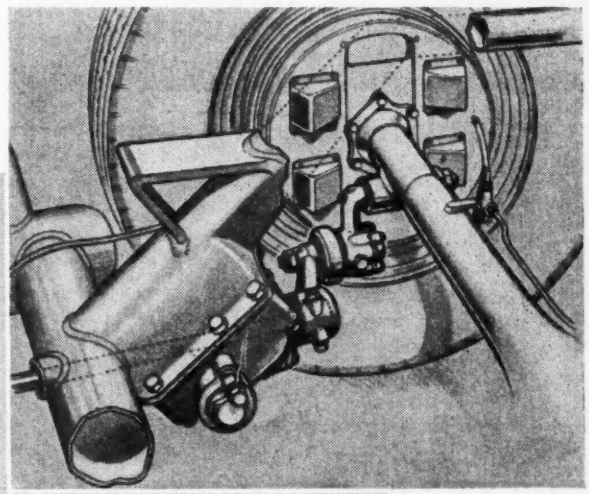


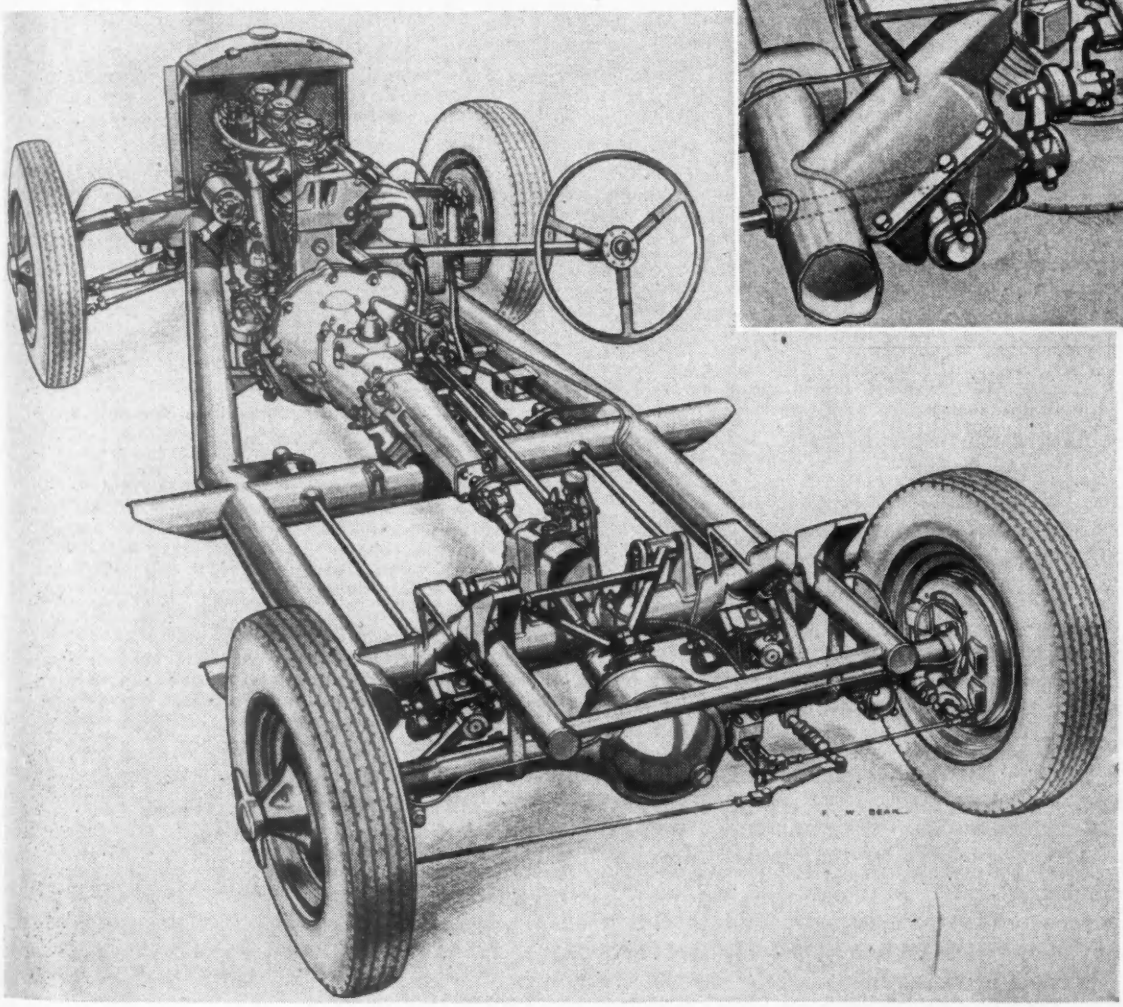
Two views of Frazer-Nash model showing its clean lines. Wheelbase is 96 in. and chassis weight about 1200 lb.

New High Speed Car of British Design



Unusual chassis features of this high-speed sports and racing car, the British Frazer-Nash, are a rigid tubular frame, torsion-bar springs for the rear, and a triangular supporting strut for the rear axle. The base of this triangular member, as shown in the chassis drawing, is attached to the frame and the apex of the triangle is bolted to the differential housing to prevent sideways movement of the axle. The torsion bars are attached to the rear axle through double-acting shock absorbers, as illustrated in the insert drawing. Also of interest are the four small air scoops on the brake drums for cooling. The rods seen below the rear axle in the chassis drawing are for hand brake operation. Power plant of this racing car is a six cylinder overhead-valve engine developing 120 hp at 5500 rpm. (Courtesy of *The Autocar*, London)





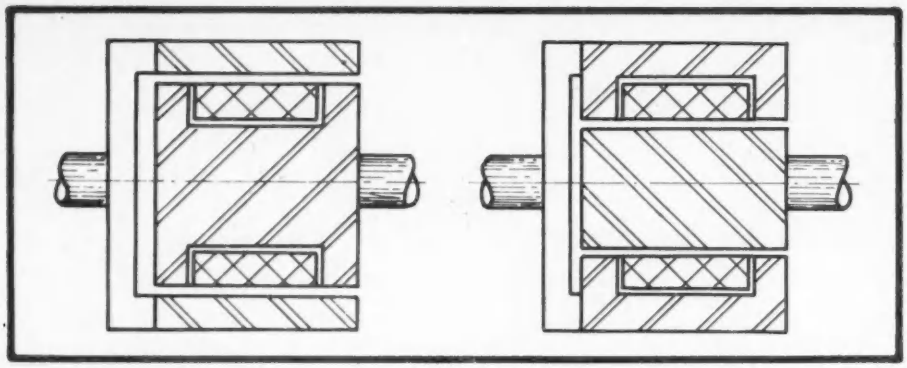


Fig. 1—Possible designs for the magnetic fluid clutch are shown here in cross-sectional drawings. The one on the left has the magnetizing coil in the inner driven member, while the other has the coil in the driving element.

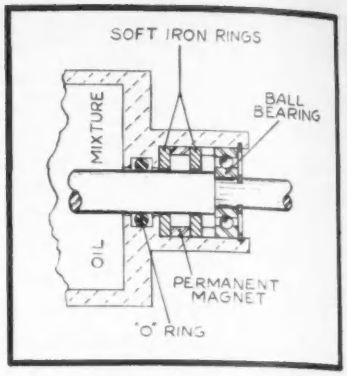


Fig. 2—This design of a magnetic lock eliminates the possibility of iron particles getting into ball bearings.

Magnetic Fluid Clutch of U

Bureau of Standards Develops Revolutionary Type of Coupling Having Automotive Applications

By Robert C. Mack

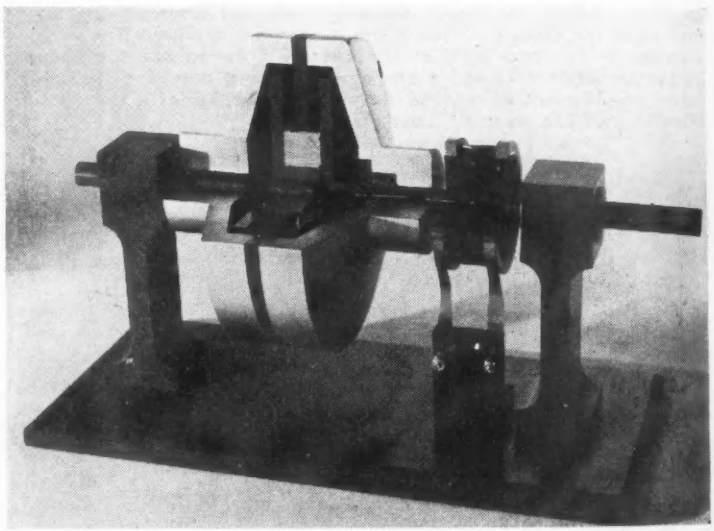
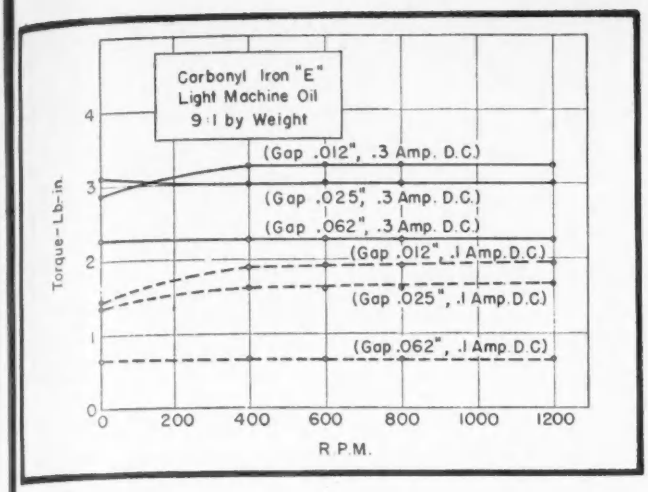


Fig. 3—Cutaway model of a simple multiple-disk magnetic fluid clutch. The mixture of iron and oil is contained in the clutch casing, and the electromagnet for energizing the coil windings is in the center of the clutch. By varying the strength of the magnetic field, which controls the degree of locking between the driving ring and the driven plates, any value of torque up to locking can be transmitted. The driven member is attached to the right-hand member, and the driving member to the left-hand shaft.

DEVELOPMENT of a unique type of magnetic fluid clutch, which operates on a newly discovered and revolutionary principle involving the frictional forces exhibited by a mixture of magnetic particles and oil, has been announced by the National Bureau of Standards. The new clutch has extensive application in automobiles, servo mechanisms, automatic control of machinery, and in many other fields. Its advantages are smoothness and ease of operation, a fully controllable degree of slip, simplicity of construction, long life and 100 per cent efficiency when locked.

Inventor of the new clutch is Jacob Rabinow, chief of the Ordnance Mechanics Section of the National Bureau of Standards, who also discovered the principle upon which it operates. Mr. Rabinow found that, when the space between two parallel magnetic surfaces is filled with a mixture of powdered iron and oil, and when a magnetic field is established between the two plates, the mixture apparently solidifies and binds the plates against movement parallel to their surfaces. Since the magnetic field can be produced by an electric current, a very simple means is thus available for control of the binding forces over a wide range.

This newly discovered effect can be applied to clutch operation with a very simple design. Only two moving parts are required: a driving and driven member which do not change



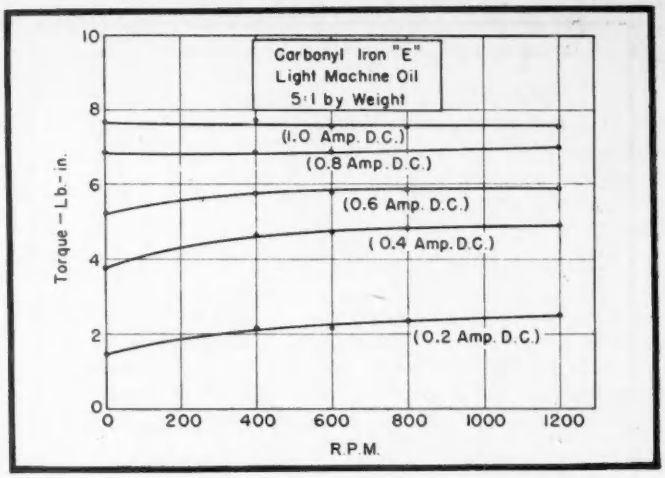


Fig. 5—(Top Left) Performance curves for one in. by 1¼ in. cylinder clutch, showing torque transmitted for various gap widths.

Fig. 6—(Top Right) Curve of torque vs speed for three in. disk clutch.

Unique Design

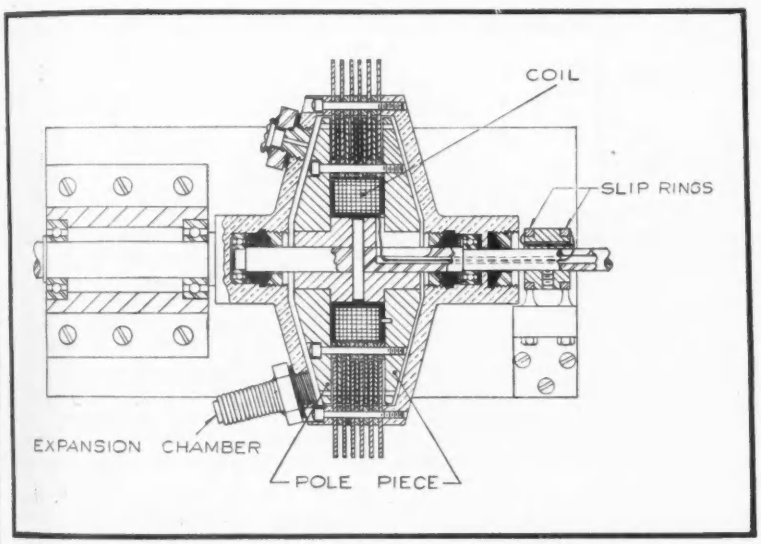


Fig. 4—This drawing shows how a magnetic fluid clutch can be expanded to have any number of alternate driver and driven plates.

TABLE 1— Torque of three-in. Disc Clutch for Various Magnetic Powder Mixtures

Powder	Liquid	Proportions by Weight Powder: Oil	Torque in lb-in. for one amp d-c
Carbonyl iron E	Light machine oil	5:1	7.7
Carbonyl iron E	Light machine oil	4:1	5.7
Carbonyl iron E	Light machine oil	3:1	5.5
Carbonyl iron E	Light machine oil	2:1	4.5
Carbonyl iron E	Light machine oil	1:1	2.3
Carbonyl iron E	Silicone DC 500	10:1	8.0
Carbonyl iron E	Silicone DC 500	2:1	4.7
Carbonyl iron SF	Light machine oil	4:1	4.3
Stainless-steel flakes	Light machine oil	3:1	3.3
Hydrogen reduced iron	Light machine oil	1.5:1	2.3
Magnetic iron oxide	Light machine oil	1.7:1	1.1

relative position except in rotation. The most convenient arrangement, as illustrated in the drawings of Fig. 1, comprises an outer shell attached to the driving shaft and enclosing a rotor attached to the driven shaft. A circular coil is provided in either the outer shell or the rotor, with electrical leads connected to slip rings on the driving or driven shaft. The gap between the two rotating elements, approximately 1/16 in., is filled with the mixture of powdered iron and light machine oil. When the coil is energized, a magnetic field is established between the two rotating elements, and the iron particles "freeze" in the mixture, binding the two members together. Current requirements are low. A proposed eight in. diameter clutch for automobiles, capable of transmitting the torque of a 100-hp engine and designed for operation on a six-volt system, would require only one amp., according to the Bureau of Standards' estimates.

Smoothness of operation of the clutch is due to the fact that all contacting surfaces, both of the clutch plates and of the iron powder, are coated by a lubricant. There is no chatter, such as frequently occurs with a conventional dry-friction clutch. In some forms of the magnetic fluid clutch, the value of static friction does not differ appreciably from the value of kinetic friction; hence, no discontinuities in torque exist at the initiation of slip. The control is extremely smooth from the minimum, which is determined by the viscous drag of the oil, to the maximum, which is determined by the magnetic saturation of the iron. Torque transmitted is proportional to the control current over a wide range of torque values. There is no slippage when the load is below the de-

Engineering Library

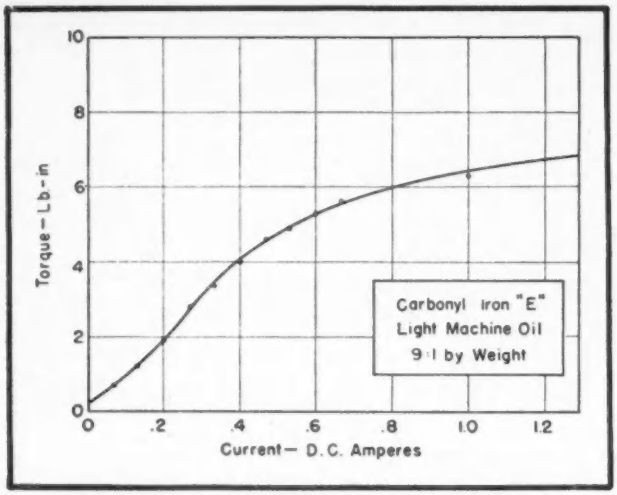


Fig. 7—Torque vs current for three in. disk clutch—static test.

signed slipping torque of the clutch.

Another major advantage of the new clutch is that wear is practically non-existent. All of the working parts are bathed in oil, and slipping occurs only between the iron particles and the smooth face surfaces of the clutch. If any of the surfaces wear off, the iron dust simply adds to the iron powder already in the oil mixture. Also, since the gaps between the driving and driven members are fairly large, any such wear would have a negligible effect.

Most obvious application of the National Bureau of Standards magnetic fluid clutch is for automobiles. The new clutch would be extremely inexpensive to manufacture; should be particularly free from maintenance problems; and, in combination with a planetary transmission, would be easy to adapt to automatic action. Since the amounts of electrical power required to control the magnetic field are small, it would be a simple matter to incorporate in the electrical circuit an automatic control sensitive to changes in acceleration. For instance, an accelerometer with sliding weights and a variable resistance could automatically control the amount of current to the coil so that the engine could deliver peak torque under all conditions of acceleration.

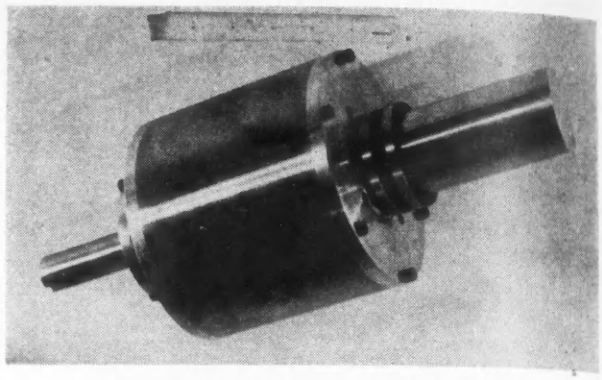


Fig. 9—Photo of the six-in. cylinder clutch.

Design Factors

The design principles of the magnetic circuit of the clutch are no different from those used in all other electromagnetic machinery, with the possible exception of the permeability of the powdered iron and oil mixture. A permeability of eight is used, which means that an iron powder gap of, for example, 0.080 in. has the same reluctance as an air gap of 0.010 in. This increased permeability of the gap greatly simplifies the design and construction of the coupling.

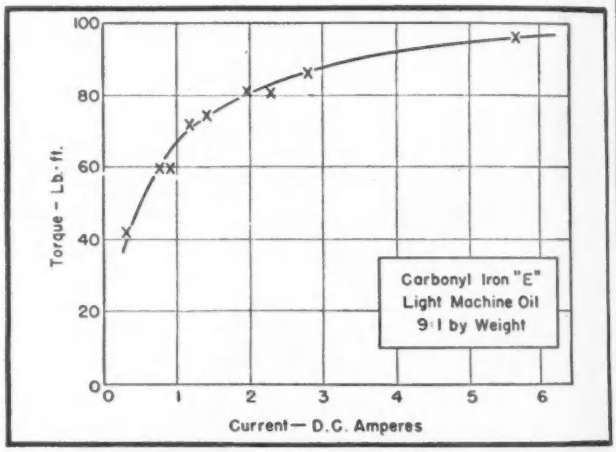


Fig. 10—Performance curve of six-in. cylinder clutch, showing torque transmitted vs amperes.

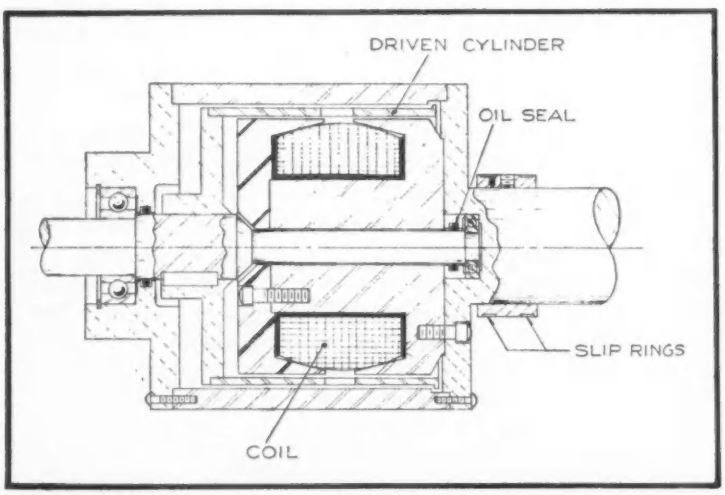


Fig. 8—Cross section of the six-in. cylinder clutch. This design, of the type suitable for use in automobiles, is capable of transmitting 40 hp at 3000 rpm.

One of the main considerations in the choice of gap dimensions is the effect of viscous drag. In a clutch suitable for use in automobiles, the viscous drag of the clutch plates when the magnet is de-energized must be kept to a minimum. This drag may be reduced by using a thinner mixture of iron and oil, using lighter oil, increasing the spacing between the plates, or by employing a mechanical device which changes the spacing between the plates automatically when the clutch is demagnetized. Normally this viscous drag is a (*Turn to page 78, please*)

AIRBRIEFS

By ROBERT McLARREN

TRANSPORT LEASE

The Air Force has offered to lease all comers a substantial number of Curtiss C-46F Commando twin-engine transports at a flat rate of $300 per month per plane. The Commando is the largest twin-engine transport in the world with a useful load of 7½ tons and a cruising speed of about 220 mph. The C-46F model features loading doors on both sides of the fuselage, designed for double paratroop exit lines. The move is believed the first in a general program to aid both scheduled and non-scheduled transport lines as an adjunct to the Air Forces. By providing this equipment, training and experience will be broadened among civilian carriers which might prove invaluable in the event of emergency. The President's Air Policy Commission recommended military cognizance of future large transport design and construction.

AIR FORCE BUYS PIONEER

A total of 23 Northrop Pioneer trimotor transports has been sold to the Air Force for use as short-haul, limited landing facility craft. Of the total, 13 will be assault transports and 10 fitted for Arctic rescue work. The contract totals $5,500,000. The Pioneer was originally designed for Central and South American "bush freighter" duties and features a short takeoff run of only 450 ft. fully loaded. The three engines provide increased reliability. Although offered commercially since the end of the war, no Pioneers have been sold. Air Force is thinking increasingly of "front line" air delivery of supplies.

PACK PLANE DESIGNED

A detachable fuselage version of the Fairchild C-119 Packet is now under construction for the Air Force. Advantage of the configuration is its ability to detach pack and return to rear area without waiting for time-taking cargo handling procedure on ground. Known as the C-120, the Pack Plane will enable the Air Force to deliver complete command units, surgical units, communcation centers, etc., ready for field installation. It will also permit the combined delivery of ammunition or equipment and the pickup of 36 litter patients with three attendants on a single mission. The craft will be powered by two Pratt & Whitney Wasp Major engines of 3250 hp each. Major assemblies of the Packet will be used in the new design. Design problem is the landing gear since the presence of the pack prevents use of a nose gear installation. Fairchild Engine and Airplane Co. engineers have produced a quadricycle landing gear which retracts completely within the booms.

RADIAL POWER UP

Development of standard reciprocating aircraft engines did not stop with V-J Day (AUTOMOTIVE INDUSTRIES, March 1, 1947) as is indicated by the latest model of the Wright Cyclone engine. Known as the R-3350-26W, this latest model of the famed Cyclone is rated at 2700 hp for takeoff and at upwards of 3500 hp for takeoff using water injection. Used throughout the war on the Boeing B-29 Superfortress bomber and many other combat aircraft at a rating of 2200 hp, this latest model is designed for use in the Douglas AD-1 Skyraider dive bomber of the Navy.

IAS MEETING BRIEFS

Engineers of the Flight Propulsion Research Laboratory of the National Advisory Committee for Aeronautics are confident that the aircraft industry can provide greatly increased efficiencies out of current engines and a series of papers delivered at the Third National Flight Propulsion Meeting of the Institute of the Aeronautical Sciences showed how. The reciprocating engine can be greatly improved by compounding with a gas turbine and this system offers a 55 per cent reduction in fuel consumption using present fuels and conventional compression ratios (4½ to 7) and turbine inlet temperature of only about 1340 F. The gas turbine driving a propeller can further reduce specific fuel consumption to as low as 0.30 if a pressure ratio of 30 could be obtained. The turbojet engine itself could be improved to a specific fuel consumption of 0.75 if a pressure ratio of 40 could be obtained. Most interesting possibility is a two-stroke compression ignition design which is theoretically capable of producing four horsepower per cubic inch displacement! Using a 2000 psi maximum cylinder pressure and a maximum temperature of 1540 F, such a design could reduce the fuel consumption by 80 per cent over existing engine types.

LOW-PRICED PERSONAL AIRCRAFT

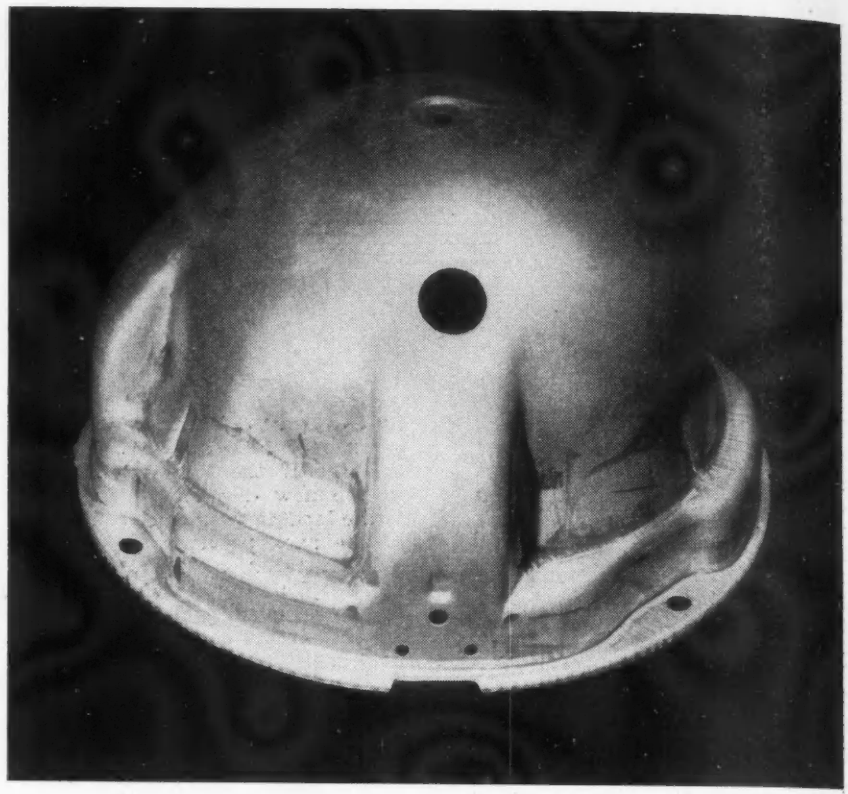
Piper Aircraft Corp. is now marketing the lowest price airplane on the market with its new Vagabond design selling for only $1990 flyaway Lock Haven, Pa. The two-place craft is powered by a 65 hp Lycoming engine, cruises at 90 mph and has a 300 mile range. Piper also offers the lowest priced four-place design, the Family Cruiser at $3825. These, together with the $2495 Cub Special, comprise Piper's 1948 competitive bid for low-priced aircraft sales. With the sellers market nearing its close, the personal aircraft industry is preparing for its summer-1948 opening of the competitive battle and Piper has taken the low-price-tag approach directly to the consumers pocketbook.

INDUSTRY EXPANDING

For the first time since the Fall of 1944 the aircraft manufacturing industry is beginning to expand substantially. Confident of a July 1, 1948 increase in military procurement, the industry is dusting off unused facilities, hiring new workers and drawing up production plans. Although current procurement budget stands at just over one billion, an additional one or two billion seems a certainty in this Congressional session as a combination political reprisal against Truman's omission of Air Power from his St. Patrick Day's speech and in tune with the Services' strengthening of its international position.

Small orders are already being doled out to help "needy" companies hold on until the new fiscal year, prototypes are being rushed through final acceptance tests and employment is beginning to move off the curve at an accelerating rate. Many industry leaders are beginning to smell the wartime smoke, and it smells expansion. Standby plants are being handed back to direct Air Force and Bureau of Aeronautics administration and at least one (Boeing Wichita) is being placed back in partial operation. De-mothing operations are creating a need for additional spare parts. A two-billion dollar year seems a certainty for the industry and few doubt that the procurement recommendations of both the President's Air Policy Commission and the Congressional Air Policy Board will be met in substance if not detail.

Secretary of Defense Forrestal's smoke-clearing Key West conference, which handed strategic bombing irrevocably to the Air Force, has vastly cleared the air for procurement planning purposes and set in motion the badly needed joint plans development, the omission of which was literally damned by both Air Policy groups as the root of present military difficulties.



The headlamp housing is an example of real deep drawing. The aluminum stamping weighs only 1.1 lb compared with 3.0 lb in steel.

Where Aluminum Replaces Steel in Ford and Mercury Cars

Table I—Current Aluminum Substitutions for Steel in Ford and Mercury Cars

PART NAME	FORD Rough Weight Per Car (lb)		MERCURY Rough Weight Per Car (lb)	
	Aluminum	Steel	Aluminum	Steel
Floor Board Extension	6.8	15.2	6.8	15.2
Running Boards	8.6	19.2	8.6	19.2
Radiator—Air Shield Deflector	....	....	4.6	12.7
Head Lamp Housings	1.1	3.0	1.1	3.0
Voltage Regulator Cover	0.2	0.6	0.2	0.6
Radiator to Front Cross-member	1.2	3.3	....	....
Radiator Grill to Radiator Shield	1.6	3.5	....	....
Hood Auxiliary Bar Extension	1.3	2.8	....	....
Rear Stone Deflector (Center)	0.9	1.9	....	....
Cowl Vent	0.4	1.1	0.4	1.1
Oil Breather Cap Assembly	0.1	0.3	0.1	0.3
Cover—Floor Pan Rear Gas Gage	0.14	0.33	....	....
Clutch Housing Inspection Cover	0.08	0.15	....	....
Air Cleaner	2.5	5.0	2.5	5.0
Headlight Ball Ring	0.35	1.0	0.35	1.0
Total Weight	25.27	57.38	24.65	58.1

TAKING the realistic viewpoint that the elimination of sheet steel in mass produced motor vehicles—even to a slight extent—will permit the building of more cars, Ford Motor Co. has made considerable progress during the past year in replacing steel with aluminum in a variety of small stamped and formed parts in Ford and Mercury models.

Ford applications of aluminum break down into three broad categories—some parts that permit the elimination of process operations such as rust-preventive coatings actually show tangible savings; another group of parts permits them about to break even on costs; and perhaps a larger group represents parts which cost more in aluminum but have been adopted despite that. Nevertheless, Ford intends to continue the use of aluminum in many instances where it has been applied in current production, and is actively pursuing the study of still further applications.

So far as engineering economy is concerned, Ford experts and the raw materials suppliers realize that the immediate applications of aluminum do not begin to exploit the economic possibilities of the light metal.

At the present time designers are obliged to substitute aluminum for steel—part by part—without possible change in design or form. As a matter of fact, its adoption for deep-drawn parts even depends upon the use of the same press dies as for steel.

Similarly, welding is avoided—not because aluminum cannot be welded—but because of the extra investment and loss of time involved in the installation of the special welding equipment required for aluminum welding. At the moment there is a question whether aluminum welding is as economical as steel welding in mass production. But this problem has not been fully explored and should be subject to further development as times goes on.

For new product design, the adoption of aluminum may have a different complexion through an improvement in relative cost by changing design to suit the properties of aluminum, by selecting parts for maximum economy, or by changing process specifications. The new models now under consideration are more likely to find economic applications of aluminum.

This article marks the first disclosure of the aluminum parts in actual production at this time for Ford and Mercury cars. In Table I are listed the current applications by part name, showing the relative weight of the part in steel and aluminum. The weights given in the table represent the total weight per car, thus taking into account not unit weight but the weight of the number of pieces per car.

The table discloses that Ford has eliminated approximately 60 lb of steel in the Ford and Mercury models. Assuming an estimated production of 725,000 cars per year, the total saving in steel should be around 21,750 tons. Looking at it another way, this saving makes possible the production of an additional 21,750 cars, assuming that the total tonnage of steel available in 1948 will remain about the same.

The tabulation in Table I covers only those parts already released for production. The list of parts in various stages of study and others in experimental production is easily two or three times as large. Moreover the substitution program naturally is in a constant state of flux. Here and there are parts that have been tried in aluminum and changed back to steel for one reason and another. Too, certain parts slated for aluminum have remained in steel owing to the availability of salvage material at the present time. On the other hand the range of possible applications is so extensive that new parts are being released for production constantly.

The largest single piece now being made in aluminum, as indicated in Table I, is the floor board extension. It weighs 15.2 lb and represents a considerable saving in steel per car. This part is fastened to the body structure by bolts and presents the only exception to the rule that aluminum is not considered currently for body parts.

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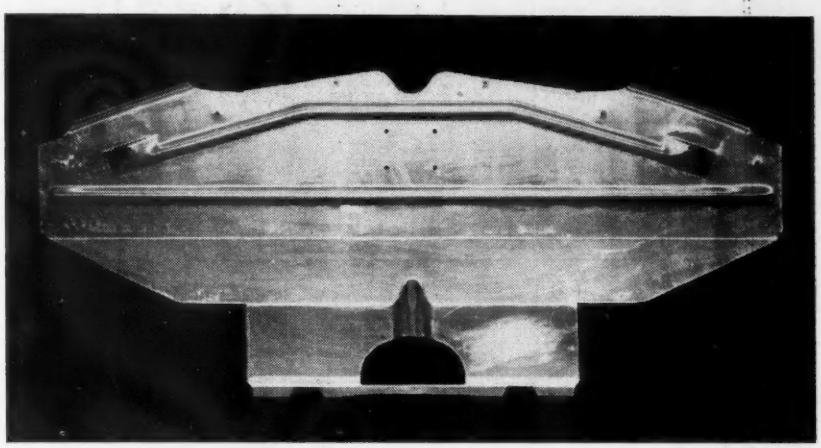
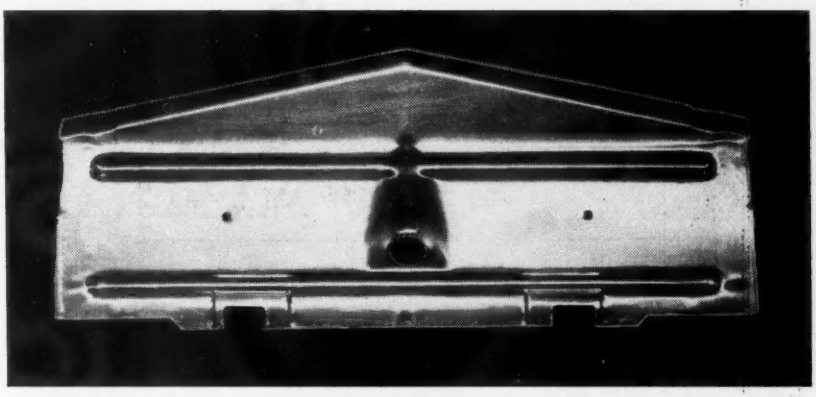
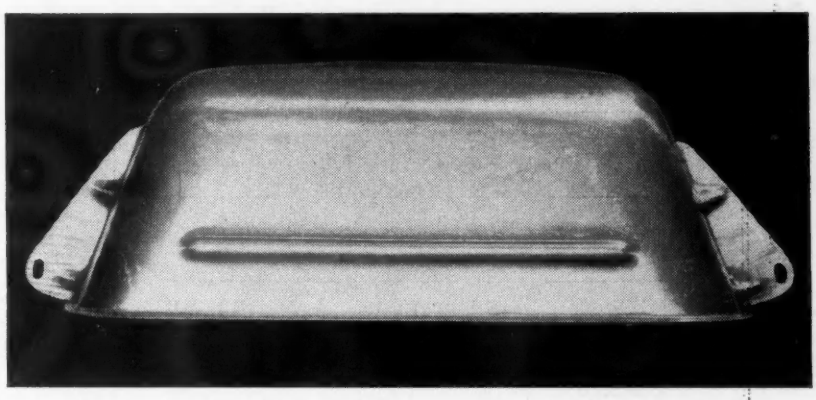


This is the radiator air shield deflector used on the Mercury models. It weighs 4.6 lb in aluminum, 12.7 lb in steel.



This radiator grill to radiator shield stamping weighs 1.6 lb in aluminum, 3.5 lb in steel.



Hood auxiliary bar extension weighs 1.3 lb compared with 2.8 lb in steel.

AIRCRAFT GAS TURBINE ENGINES

COUNTRY AND MANUFACTURER	Model Number	Type of Propulsion Unit	Performance at Sea Level—Standard Conditions Zero RAM				Performance at Altitude Standard Conditions					Type of Compressor	Number of Stages		Combustion Chamber			Dimensions and Weight		
			Thrust (lb.)	Propeller Shaft Hp	Rpm	Specific Fuel Consumption (Lb. per hr. per lb. of thrust)	Altitude	Speed mph	Thrust (lb.)	Rpm	Specific Fuel Consumption (Lb. per hr. per lb. of thrust)		Compressor	Turbine	Number Chambers	Type	Number Burners	Overall Diameter (in.)	Overall Length (in.)	Dry Weight (Lb.)
UNITED STATES																				
Allison	400-J33-A-23	TJ	3,600	.....	11,000	1.120	NA	NA	NA	NA	NA	Cent	1	1	14	DF	14	50.50	103.0	1,735
.....	TG-18-J35-A-15	TJ	3,270	.....	7,400	1.075	NA	NA	NA	NA	NA	Axial	11	1	8	DF	8	37.50	145.0	2,425
General Electric Co.	TG-100B	PJ	500	1,900	13,000	.768	NA	NA	NA	NA	NA	Axial	14	1	9	RF	9	35.12	114.62	1,984
Westinghouse Electric Corp	X19XB	TJ	1,365	.....	18,000	1.280	30,000	500	525	18,000	NA	Axial	6	1	1	DA	24	19.00	89.8	809
.....	X9.5A	TJ	260	.....	34,000	1.600	10,000	600	184	34,000	NA	Axial	6	1	1	DA	12	9.5	49.9	145
.....	X9.5B	TJ	275	.....	36,000	1.550	10,000	600	217	36,000	NA	Axial	6	1	1	DA	12	9.5	55.2	143
.....	19XB-2B	TJ	1,560	.....	17,000	1.170	NA	NA	NA	NA	NA	Axial	10	1	1	DA	24	19.00	94.0	693
.....	24C4B	TJ	NA	.....	NA	NA	NA	NA	NA	NA	NA	Axial	11	2	†	DA	NA	27.00	120.0	1,168
.....	24C4C	TJ	NA	.....	NA	NA	NA	NA	NA	NA	NA	Axial	11	2	†	DA	NA	27.00	120.0	1,200
GREAT BRITAIN																				
Armstrong-Siddeley	Python	PJ	1,150	3,670	8,000	359*	NA	NA	NA	NA	NA	Axial	.....	2	.....	.....	.....	54.50	136.0	3,010
.....	Mamba	PJ	.....	.....	.....	.....	NA	NA	NA	NA	NA	Axial	.....	.....	.....	.....	.....	29.68	57.0	760
Bristol	Theseus 11	PJ	590	2,200	8,200	0.80	30,000	300	330	8,200	0.61	(b)	2	1	8	DF	8	49.00	105.4	1,860
.....	Theseus 21	PJ	510	1,950	8,200	0.70	30,000	300	300	8,200	0.51	(b)	2	1	8	DF	8	49.00	82.6	2,310
DeHaviland Engine Co., Ltd.	Goblin II	PJ	3,000	.....	10,200	.....	NA	NA	NA	NA	NA	Cent	1	1	16	DF	16	49.85	100.5	1,644
.....	Ghost	PJ	5,000	.....	10,000	1.060	NA	NA	NA	NA	NA	Cent	1	1	10	DF	10	53.00	115.5	2,011
Napier	NAid	PJ	241	.....	18,250	126.8*	NA	NA	NA	NA	NA	Axial	.....	.....	5	DF	5	28.00	102.0	1,122

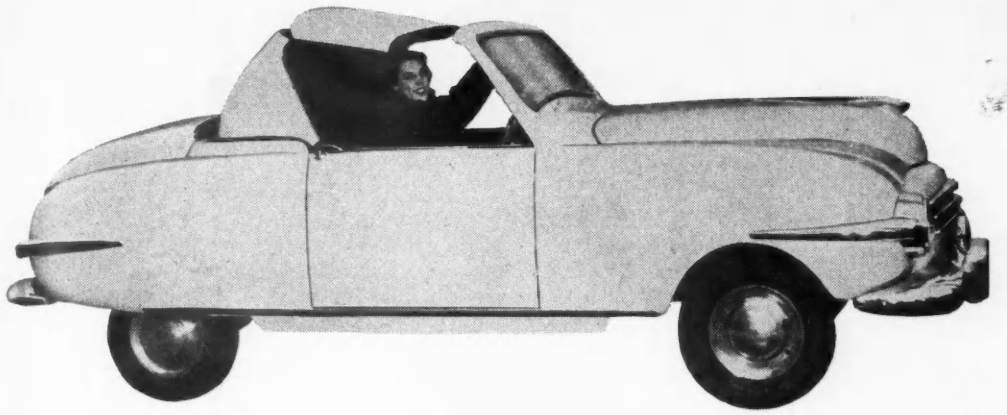
BBREVIATIONS
*—Gallons per hour †—Double Annulus Chamber DA—Direct flow, annular chamber DF—Direct flow (b)—Multi-stage axial and single stage centrifugal
Cent—Centrifugal NA—Information not available PJ—Propeller—jet RF—Reverse flow TJ—Turbo—jet

The Ram-Jet As a Supersonic Propulsion Plant

By W. H. Goss and Emory Cook

By W. H. Goss and Emory Cook
Applied Physics Laboratory
The Johns Hopkins University

THE ram-jet engine for propulsion at supersonic speeds, which is being pioneered in the United States, is yet in an early development stage. Early successes, however, are sufficient to warrant some optimism as to the eventual full exploitation of its potentialities. For sustained propulsion at supersonic speeds no other engine can compete with a ram-jet. Its outstanding features are its high power per unit frontal area and per unit weight, its high specific impulse as compared to rockets, and its mechanical simplicity. This mechanical simplicity is deceiving, however. The aerothermodynamic difficulties seem to increase in compensatory fashion. Perhaps more than any other engine, the ram-jet demands a thorough knowledge of the aerodynamic and combustion processes upon which its successful functioning depends. Ram-jet scaling from small model to large is a combustion, not a mechanical problem. An insight into the individual processes, which can only come from a wealth of supporting research into the fundamentals is the best hope for extending ram-jet sizes and speed ranges beyond those where laboratory testing facilities on full-scale units become impractical.

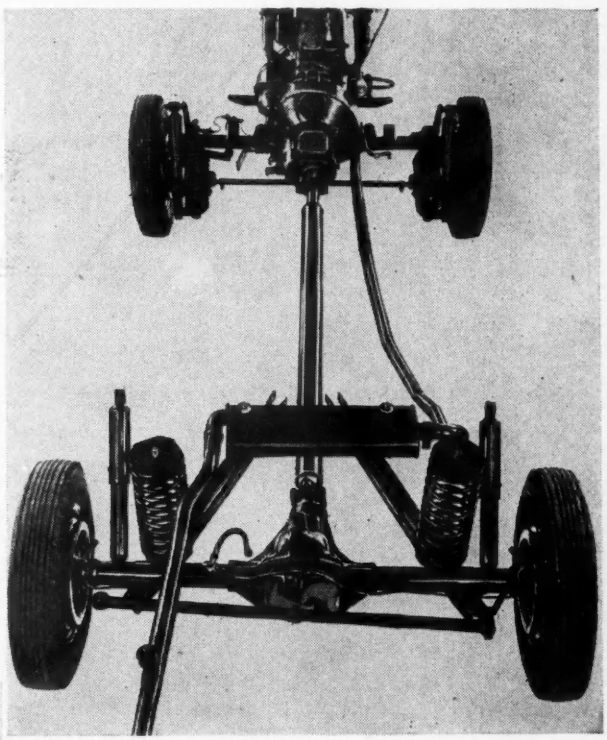


An interesting feature of the Playboy is the all-steel folding top, shown here in the half-way position. It is manually operated, but counter-balanced to facilitate raising and lowering. The three-passenger Playboy has a 90-in. wheelbase, an over-all length of 155 in.

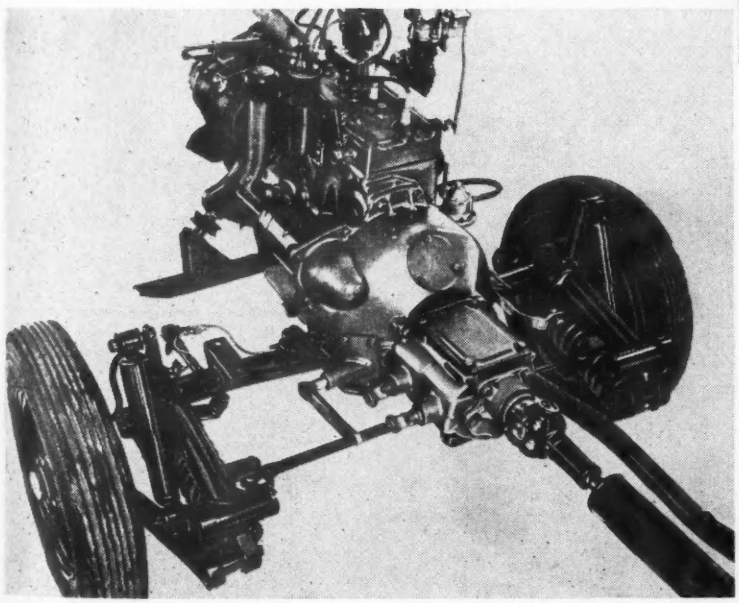
Distinctive Features of the Playboy

DISTINCTIVE features of the new Playboy convertical, illustrated here, are its simplified body construction, a folding steel top, and an unusual horizontal coil-spring suspension for the front end. The body and frame are integral, welded into a single unit, and the body structure is composed of only 48 stampings. Schedules of the Playboy Motor Car Corp. call for production of this small car to begin at the rate of 100,000 cars per year by Jan. 1, 1949.

The company recently moved into a modern half-mile-long structure in Tonawanda, N. Y., which was built by the Government during the war and operated by Chevrolet for producing aircraft engines. A pilot assembly line has been set up in this plant, and the pilot production program, which calls for a total of 500 cars, will merge into mass production when tooling of the plant is complete. The company is now setting up a dealer and distributor organization. Price of the Playboy has been set at $985 FOB Buffalo.



Chassis details of the Playboy are pictured in this overhead view. Rear suspension, at present, is by coil springs, but the company is considering the use of leaf springs. The rear axle is Spicer, semi-floating with hypoid gears. The diagonal wishbone, trackbar, springs and hydraulic shock absorbers are all insulated in rubber bushings. Brakes are Wagner hydraulic



(Left) Front suspension, as pictured here, employs a rigid axle and horizontally mounted coil springs. Vertical motion is damped by aircraft type hydraulic shock absorbers. The transmission is Warner Gear, has three speeds and reverse with synchro-mesh. Present power plant is a 40-hp four cylinder L-head Continental or Hercules; however, a 48-hp engine is under consideration.

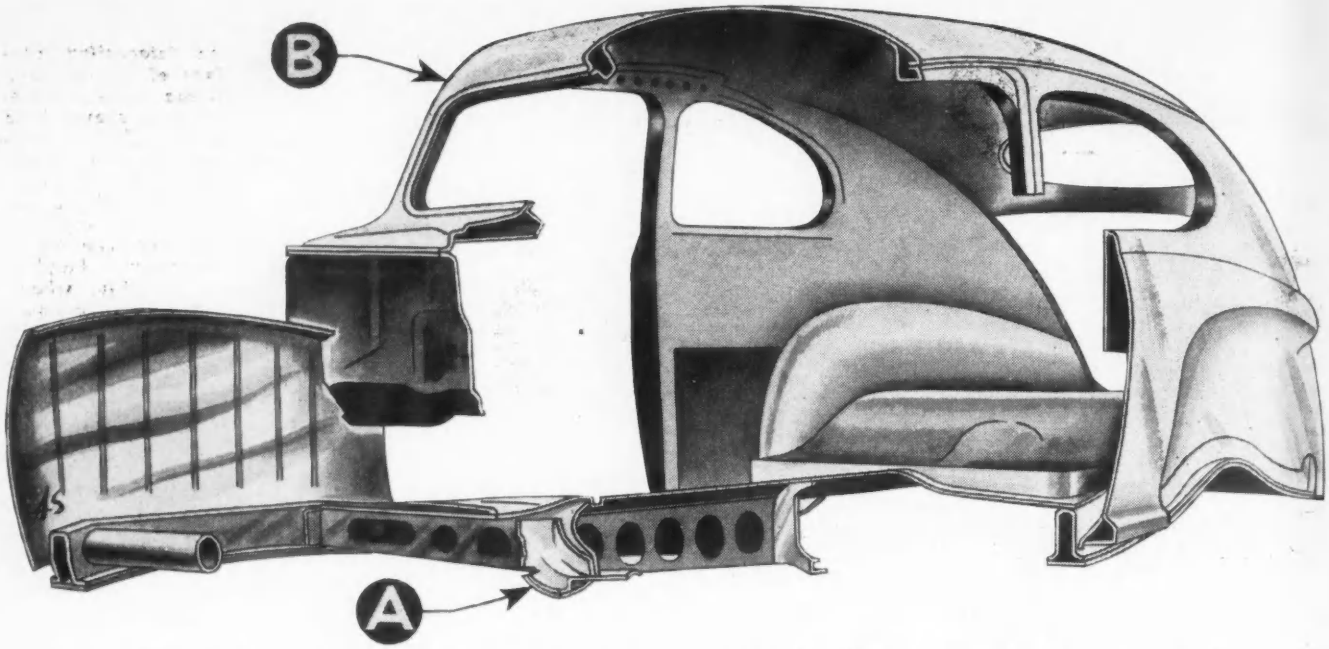


Fig. 5—First design of the improved frame and body structure. A and B are shown in detail by additional drawings.

Lighter and Stronger Car Bodies Using Aircraft Designs Practices

Research Shows That Strength and Rigidity Requirements of Conventional Passenger Car, as Determined by Static Tests and Stress Analysis for Bending and Torsion, Can Be Met by Lighter Body and Frame Structure, When Built in Accordance with Aircraft Design Principles.

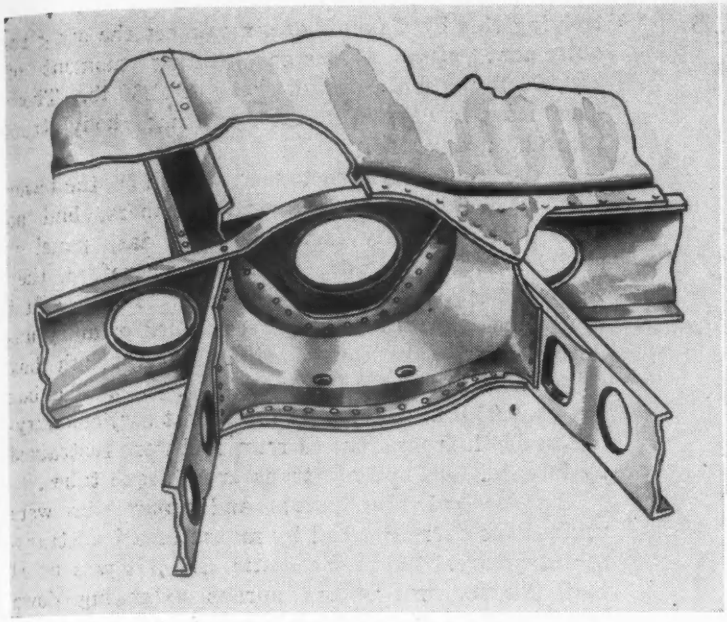
By E. W. Conlon and G. W. Lothrop
Department of Engineering Research,
University of Michigan

A RESEARCH project, established at the University of Michigan by an automobile manufacturer, called for the application of the principles of aircraft structural design to automobile body design. It was not anticipated that a design would be produced which could be put into production, but it was considered that the new ideas so developed could be utilized in future designs.

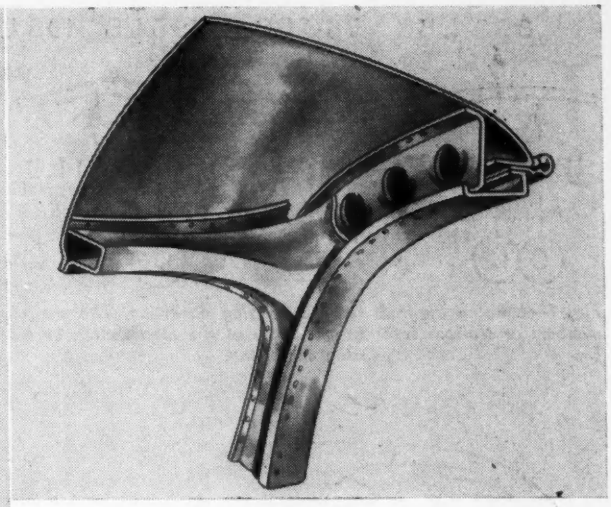
The strength and rigidity of the present automobile body as determined by static tests and stress analysis for bending and torsion were used as requirements for the new design. The automobile selected for the tests was a standard five-passenger tudor sedan of conventional frame and body structure. For the bending condition, the loading consisted of five passengers at 200 lb each, complete structure 940 lb and engine group 700 lb. This loading gave a static gross weight of 2640 lb which was distributed among four concentrated points, as shown in Fig. 1. For the torsion condition only, the structural weight of 940 lb was used. The unit torsional loading for this condition was taken as 10,000 lb-in.

Static Tests of Car Structure

The static tests and stress analysis showed that the present automobile structure is highly redundant. Several members could yield without materially affecting the load carrying ability of the structure. Based on a yield stress of 36,000 psi, the complete structure was capable of a design yield load factor of 5.24 g and a design ultimate load factor of 6.00 g for the bending condition. The maximum deflection for a one-g load-



Details of the underbody structure (see A of Fig. 5).



Details of the forward door pillar (see B of Fig. 5).

TABLE I—COMPARISON OF WEIGHT-SAVING DESIGNS WITH STANDARD

MODEL	BENDING		TORSION		WEIGHT SAVING (Lb.)
	Design Load (g's)	Rigidity (Per Cent)	Design Load (Lb.-In.)	Rigidity (Per Cent)	
Standard	6	100	50,000	100	...
Design 1 (Box Beams)	6	115	75,000	125	...
Design 2 (Channel Beams)	6	100	50,000	100	160
Design 3 (Torque Box)	6	110	85,000	135	50

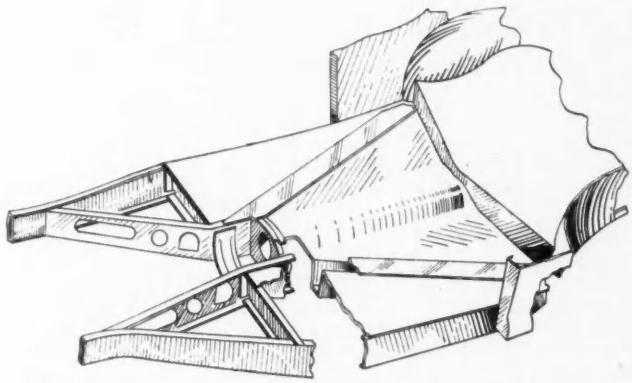


Fig. 6—The second design, a closed box structure, is shown in this drawing.

ing was 0.160 in. at a point 53 in. aft of the front support. The load distribution resolved to the frame carrying approximately 45 per cent of the total bending load and body structure carrying the balance of 55 per cent.

Several critical structural points were noted, as shown in Fig. 2. The upper flange of the side frame, 56 in. aft of the front support, and the upper roof sill, just aft of the door, began to buckle at approximately 5.25 g. Other buckling failures on the frame commenced at approximately 5.75 g; the most prominent of these being the buckling failure of the upper flange of the side frame just aft of the steering column support. The bending margin of safety of the structure is shown by the curve in Fig. 3. For the torsion condition, the structure was found to be capable of carrying an applied torque of approximately 50,000 lb-in.

Design Modifications

Using the preliminary design data obtained from the static tests and stress analysis, it was possible to design an automotive structure by aircraft practices. Three different modified designs of a passenger car structure were made. The first modified design was an attempt to equal or to improve the strength, rigidity and weight of the conventional automobile structure without changing the general passenger arrangement, general chassis arrangement, body and appendage contour and styling, and the materials used. By maintaining these control factors, it was possible to compare the structural efficiency of the present body structure to the modified structure.

In aircraft design, one of the basic design practices is that two members shall not do the work of one, and usually one member shall be designed to do the work of two. Thus, the frame structure was eliminated, and the body structure was utilized as the support for the complete structure, including the support for the original chassis items.

The shear and bending moment curve for the basic bending condition, Fig. 4, shows that, at station 65, there was a maximum one-g moment of approximately 35,000 lb-in. and shear of approximately 380 lb. Mul-

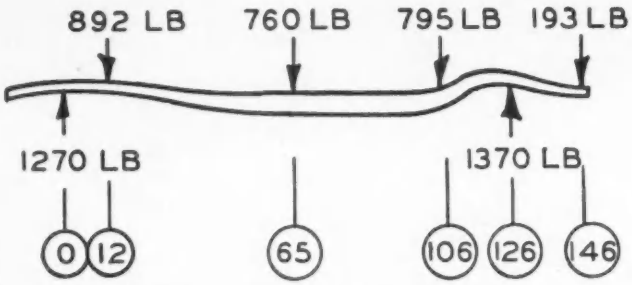


Fig. 1—Loading diagram for the bending condition. The encircled numbers or stations refer to inches aft of the zero station or front spring centerline.

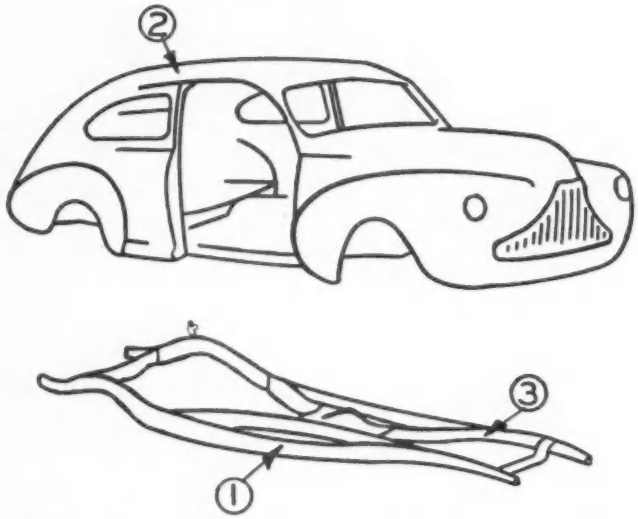


Fig. 2—The three critical structural points of the conventional passenger car tested are indicated on these drawings.

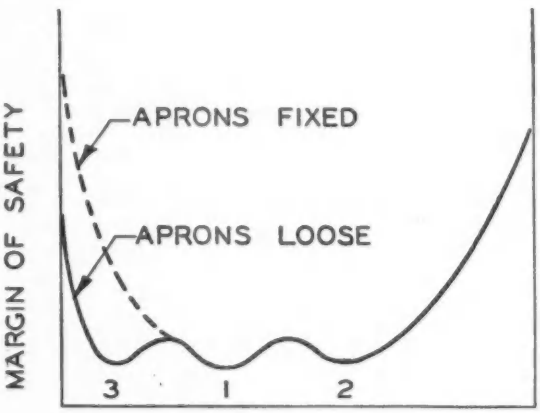


Fig. 3—The bending margin of safety of the car under test is shown by this curve. The three station numbers refer to the points shown in Fig. 2.

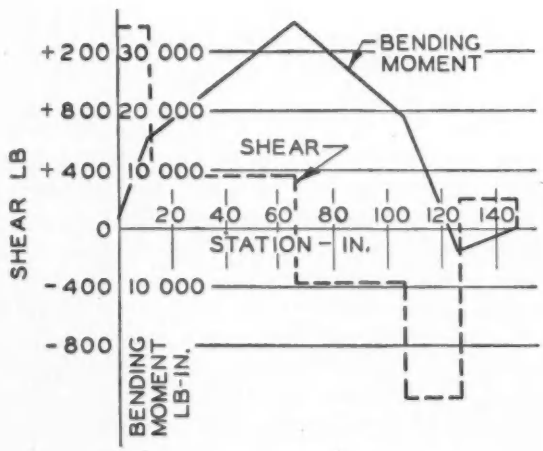


Fig. 4—Shear and bending moment curve for the basic bending condition, as determined by tests of a conventional five-passenger tudor sedan.

tiplying this by a factor of six to meet the six-g requirement gives a design bending moment of 210,000 lb-in. and a design shear of 2280 lb. These loads must be carried by the lower underbody structure and upper sills.

At the underbody structure at station 65, the lower sills, although good structural members, had no structural continuity forward of the dash panel or shortly aft of the door opening. Therefore, they were eliminated from the structure. For the first design, as shown in Fig. 5, the modified primary underbody structure consisted of two through box beams integrally attached to the floor pans. The box beams, 0.050 in. gage, were closed hat sections varying in depth from front to rear, and were restrained by integral fore and aft transverse torque tubes.

The forward door pillars and upper sills were utilized for carrying load by means of a load transfer structure. From the static tests, it was noted that the forward splash aprons extending down from the front fenders contributed to the strength and rigidity of the structure if their lower edge was attached to the side frame. Thus, by installing a 0.042 in. vertical sheet with 3/8 in. beads spaced approximately every three to five in., the forward door panels and upper sills could be utilized to carry the load. This vertical sheet would carry the basic shear and also serve the functional purpose of the original splash aprons. This panel then transferred the loads to the upper sills and roof panel. In order to maintain structural continuity, the lower edge of the shear panel was attached to the through box beams and vertically attached to the front door pillar. Thus, the load intended for the upper sill had a direct path. In the roof structure and upper sills was a channel section formed primarily by the roof flange. This section was reinforced with a fore and aft close-out web, 0.060 in. gage approximately 2 in. deep, and formed a small box section that would amply carry the loads in the upper sill.

Additional structure was added between the lower box beams for the purpose of restraining the front wheel drag forces and also to support the seats and rear engine mount. This structure consisted of an 0.060 in. C section transverse cross beam at the front-door pillar and two forward diagonal beams of 0.042 in. gage. The front seat rails were supported on intermediate ribs of 0.042 in. gage, which in turn were attached to the side box beams and floor stabilizing webs. An additional transverse stabilizing web was installed at the rear door pillar.

This type of integral structure, when compared to the original design, did not involve any changes in the controlling factors of passenger and chassis arrangement, contour and materials. From a stress analysis of this

(*Turn to page* 68; *please*)

OBSERVATIONS

By JOSEPH GESCHELIN

Safety Goggles

SAVING HUMAN EYES IS MORE OF A problem than appears on the surface. We visited a plant recently where everyone on the payroll—and that includes all executive personnel—wears safety eyeglasses all the time when in the shop and whenever entering the shop area from an office. At first it was difficult to persuade workers to wear safety glasses on the job even though as many as three eyes were lost during the course of a year. The final action that did the trick was to set up an oculist's office in the plant, examine every individual and prescribe the necessary lenses—no charge. Perhaps it was not surprising to have the oculist exclaim that some of the peole, who had never worn glasses, were greatly in need of them. They had invited trouble without realizing it.

Aluminum for Steel

A RECENT TRIP TO SOME TRACTOR plants made it evident that the steel shortage is impelling tractor engineers to study the possibilities for using aluminum as diligently as their fellows in the passenger car field. One producer is on the eve of fabricating gas tanks from aluminum because of the scarcity of heavy terne plate. If these tanks are fabricated by seam welding, the welding job will be farmed out to a local plant having welding equipment that was used in aircraft work during the war.

Fuel Economy

WHAT WITH THE SHORTAGES OF gasoline and Diesel fuel, the operators of heavy duty trucks are interested in good, technically sound methods for increasing fuel economy. We welcome suggestions and would be glad to pass them on where it would do most good.

Natural Resources

A SYMPTOM OF THE TIMES—AND OFT repeated in the past—is the scare of impending depletion of natural resources. During the current steel shortage we have noted comments regarding the petering out of the Mesabi Range—the greatest source of iron ore in the USA. Experts in this field refuse to scare. They say there is enough lower grade ore available to last almost indefinitely. They also assure us that the next level of ore quality is sufficiently good to permit making high grade pig iron without appreciable cost penalty. More recently—particularly around Washington—there is the perennial scare concerning depletion of oil reserves. Again the petroleum technologists disagree. We may have a shortage of refining capacity to meet unusual demands but there is doubtless sufficient crude under ground and in the continental shelf on the Pacific and Gulf areas to carry on for a long, long time.

Multiple Hobbing

SOME TIME AGO WE MENTIONED THE development of the multiple thread hob as a means of reducing cost and increasing productivity on certain gear cutting jobs. Barber-Colman recently announced the development of a multiple thread tool designed to produce pre-finishing tolerances. This type of tool has been in use for some time in cutting flywheel ring gears. In one plant they cut a stack of ten gears per load, in 24 minutes, with a hob life of 11,000 gears per hob.

"H-Band" Steels

THE NEW SAE MATERIALS ACTIVITY is embarking upon an educational program to enlist the support of designing engineers in the faster adoption of the "H-band" steels which are based upon hardenability specifications rather than chemical analysis. Evidence gathered by leading metallurgists proves that the full requirements of a given part in many instances may be satisfied by the lowest priced steel, given the proper heat treatment. If the end results obtained from a high priced steel can be safely realized from a steel of lower price, it is certainly of moment to engineers and management as well.

Determination of Dynamic Loads In Coach Structures

By W. E. Rice and R. O. Ellerby
Engineering Division
GMC Truck & Coach Division
General Motors Corp.

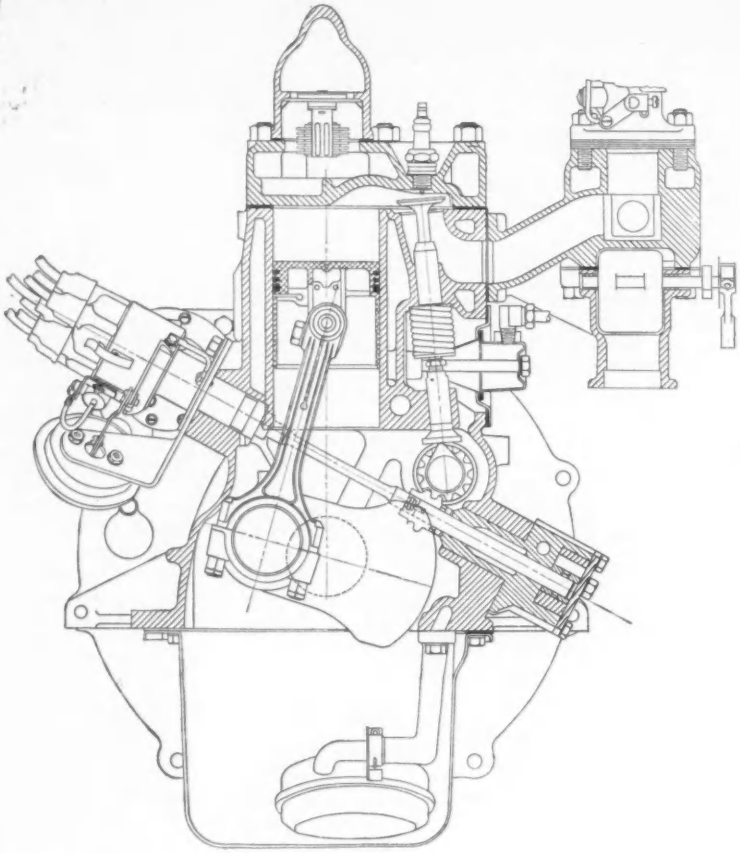
DETERMINATION of dynamic loads in coach structures is not an exact science, and until recent years designers depended on a combination of calculation and judgment to determine how much metal should be put where. Despite this fundamental limitation in design, there are many coaches which have operated over one million miles with negligible structural failures. The problem today is to determine accurately factors which provide this performance with a minimum of structural weight—that is, to learn where weight can be safely removed.

Proper use of instrumentation enables determination of dynamic loads and stresses under operating conditions. If these data can be co-ordinated with service experience, a reasonable pre-determination of structural performance may be made. However, even with all the instruments available and all types of test facilities such as a proving ground offers, their use still does not provide a 100 per cent service free coach structure. There are many stress problems that have either been overlooked or as yet unknown.

The basic element employed in strain measuring equipment for the dynamic load studies at GMC is the SR-4 resistance wire strain gage pick up manufactured by the Baldwin-Southwark Division of the Baldwin Locomotive Works. It is very light and can be installed in almost any location. No structural modifications or holes are required for installation. Displacements or strains of almost any frequency can be measured. The cost is so low that recovery of the gage is unnecessary. Physically, the SR-4 strain gage consists of a flat-wound grid of fine wire bonded to a thin piece of tough paper. The grid is usually covered with a small piece of felt for protection and thermal insulation.

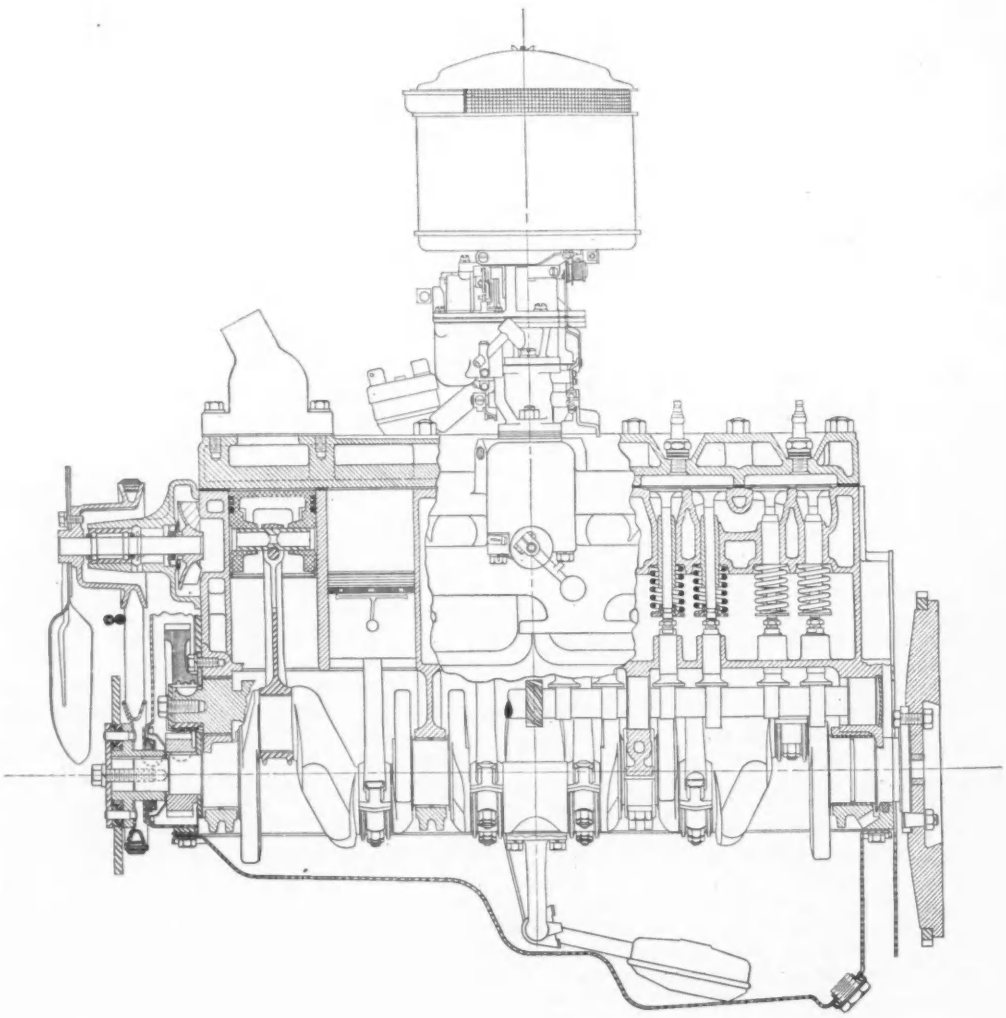
The whole gage is cemented directly to the structure being tested. As the structure is strained, the gage is also strained, thus changing its electrical resistance in proportion to the applied strain. This resistance change is used as a measure of the strain in question.

The recording oscillograph used in the studies is of the multiple channel type containing twelve channels. Each channel of the oscillograph contains a galvanometer element. A mirror attached to and moving with each of these elements reflects a pin-point light beam on to a moving film. The multiple channel instrument provides for the simultaneous recording of several strain, load, displacement or other measurements on a single continuous record, all in exact time phase.



Willys Six-Cylinder Engine

THE six-cylinder L-head engine shown here in longitudinal and transverse cross section is the power plant for the new Willys-Overland passenger station wagon and passenger car (see Automotive Industries Nov. 1, '47). It has a three in. bore; 3½ in. stroke; 148½ cu in. displacement; and is rated at 72 bhp at 4000 rpm. Compression ratio is 6.42 to 1, and it develops 117 lb-ft torque at 1600 rpm.



NEW Production and Plant EQUIPMENT

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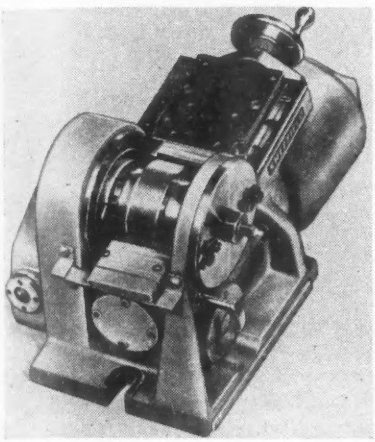
J-68—Self-Timing Crushing Device

A new self-truing motorized crushing device for forming cast iron "crushtrue" rolls and "crushtruing" grinding wheels is announced by the Sheffield Corp. of Dayton, Ohio. It is a self-contained, two-speed unit employing a carbide tool for dressing the form of a Meehanite or other close-grained cast iron roll, which is then used to crush the grinding wheel—all without removing the roll. The device is designed for mounting on the table of an 8-in. by 24-in., or larger, wet-type surface grinder. However, a modified version can be made available for cylindrical grinding in some applications.

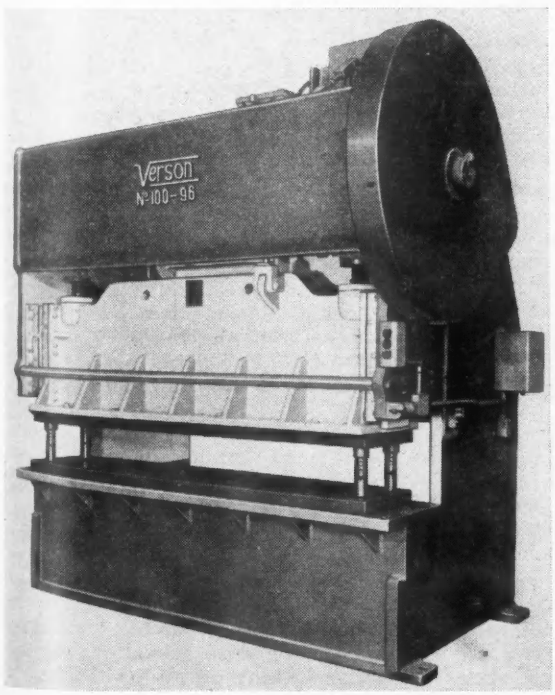


Sheffield self-truing motorized crushing device

In certain cases of simple shallow profiles it may be possible to form the blank roll directly with the carbide tool. Normally, however, it is recommended that the roll be rough formed on a lathe, then finished formed in the crushing device. As the roll becomes worn from repeated grinding wheel truings, the operator simply shifts the clutch to low speed and feeds the carbide tool slowly into the roll until the original form is fully restored. This is accomplished within three to five minutes. It is said that one of the chief advantages of this new truing device is that all elements of the form are held precisely during the grinding of quantities of parts. This is especially important in grinding thread-rolling dies, laminated sections, punch and die sections, or any flat or cylindrical work of irregular contour.

The cast iron roll must necessarily be reshaved more often than a high speed steel roll is reground, and down time will be greater. Offsetting this however, is the longer time required to recondition a high speed steel roll. Determining which type to use depends upon type of profile and accuracy requirements, quantity of production, frequency of run and, facilities for reconditioning high speed steel "crushtrue" rolls.

J-69—Verson Gang Press



To bridge the gap between press brakes and large, heavy blanking presses, the Verson Allsteel Press Co., Chicago, Ill., has developed a line of gang presses ranging in tonnage capacities from 100 to 350 tons in bed lengths from 72 in. up. These presses are especially designed for blanking, forming, punching, shallow drawing, and multiple operations whereby a series of operations may be done in one handling. Control is by means of electrical push buttons—hand or foot operated—and a selector panel for inching, one stroke, or continuous operation.

J-70—Cutter and Tool Grinder

The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, has incorporated a number of improvements in its new No. 2 cutter and tool grinder.

Dual hand table traverse knobs, traditionally located at the rear of the machine, are now duplicated at the front. The operator now has table traverse control at every possible operating position; at the front, right- and left-hand corner of the bed; behind the table, right- and left-hand side of the bed.

Vertical adjustment of the grinding wheel head has been increased 3 in. to a total of 10½ in.

Cincinnati No. 2 cutter and tool grinder

Grinding wheel spindle bearings are the pre-loaded precision antifriction type, packed in grease for life-time lubrication.

Daily lubricating requirements have been greatly reduced. Nine separate lubrication points are now serviced by a built-in reservoir and plunger pump.

In addition to the wide variety of attachments available for these machines, two types of "wet" grinding attachments are now available. One is for cylindrical grinding operations. It incorporates a motor driven pump and tank unit, built into the machine base, and includes splash guards around the table and wheel. The other attachment, separate from the machine, is for carbide grinding operations. A motor driven coolant pump and tank, and an air suction pump, are combined into one unit. A thin stream of coolant, directed to the wheel, is disintegrated into tiny drops by the rapidly revolving wheel. The air suction returns the moisture to the tank, keeping the

table and machine dry while the wheel and work are clean and cool.

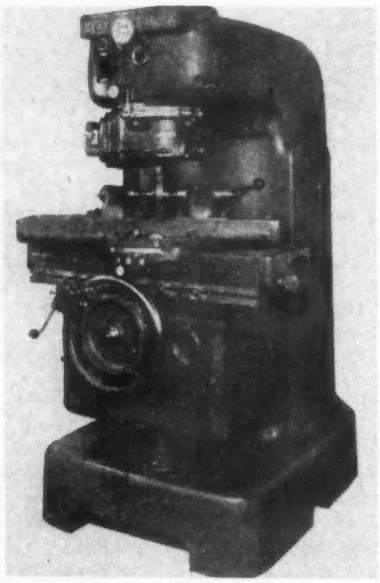
Electrical controls are built-in, recessed in a compartment at the front of the machine. A disconnect switch, operated by the latch handle on the electrical compartment door, shuts off the current when the door is opened. Additional safety will be found in the transformer unit which reduces the voltage to 110 at the push-button station. Push buttons are also built-in.

J-71—Universal Gear Shaver

The new "Red Ring" Model GCV Universal Diagonal, a recent development of National Broach and Machine Co., Detroit, Mich., can shave gears by either the diagonal or conventional method, thereby satisfying a broad range of gear manufacturing requirements.

The Universal Diagonal will handle any conventional shaving operation, that is, where the gear is automatically reciprocated parallel with its axis across the cutter and automatically fed into the cutter vertically at the end of each stroke. This is especially desirable for work gears with wide face widths.

Any gear being shaved conventionally can at the same time be given the Elliptoid tooth form by rocking the table as it is being reciprocated.



Red Ring Model GCV Universal Diagonal gear shaving machine

The degree of crowning and the position of crown are both selective.

Gears with face widths up to approximately 2 in. may be shaved with diagonal table traverse, that is, where the gear is automatically reciprocated at a diagonal angle to its axis, across the cutter and back for a total of two strokes. With this method, the center distance between any specific work

NEW Production and Plant EQUIPMENT

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gear and the cutter remains constant. Gears being shaved diagonally can also be crowned (Elliptoid tooth form) by rocking the table with adjustable cam as outlined above for conventional shaving. As in the previous case, the degree of crown is selective and the crown may be positioned at will.

Any type of gear may be taper shaved when using either conventional or diagonal shaving by locking the crowning table at the correct angle for the taper desired.

Crowning (Elliptoid tooth form) can be accomplished with standard cutters by rocking the work table, when using either conventional or diagonal shaving. Special crowning cutters are not necessary but can be used if desired.

The Universal Diagonal Gear Shaver is available in two models. Model GCV-8 in. for gears of 1 in. to 8 in. p-d. Model GCV-12 in. for gears of 1 in. to 12 in. p-d.

J-72—Vertical Pull-Up Broaching Machine

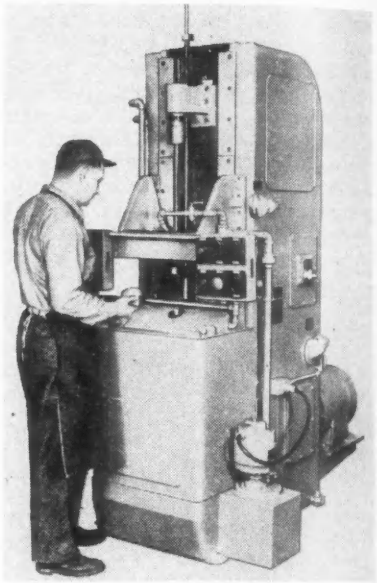
The American Broach & Machine Co., Ann Arbor, Mich., has added a VP-2-8-24 to its line of vertical pull-up hydraulic broaching machines for the high production internal broaching of small parts.

Operating principles of the new VP-2 are the same as American's full line of VP machines. It features electrical controls, push button operated, arranged to complete one full cycle on semi-automatic operation. Provision can be made, if necessary, to stop the machine at end of the broaching stroke for step-cycle operation.

Multiple tooling can be provided for greater production by increasing the number of broaching stations. Fully automatic operation is possible by building a hydraulic interlocked loading slide into the machine with a magazine type loading unit.

Floor loading height is another feature with ample work space provided between the angle table and work table. Push button controls are accessible to operator on both sides of the machine. The machine has a normal broaching capacity of 8 tons, maximum of 10 tons. Stroke is 24 in. with a variable broaching speed of 15 to 24 fpm.

Standard equipment consists of



American Model VP-2-8-24 vertical pull-up hydraulic broaching machine

semi-automatic operation with push button controls, coolant pump and piping, hydraulic pumping unit, speed control unit and pressure gage. Motor and electric starter are quoted extra.

J-73—External Gear Shaper

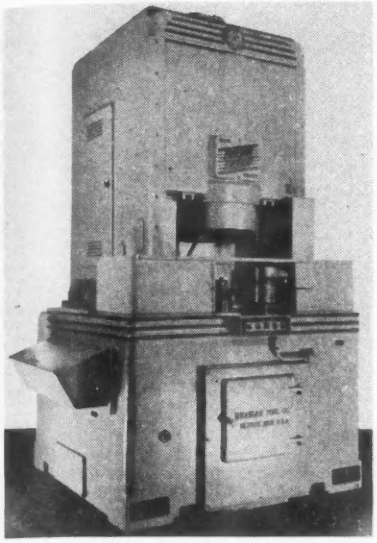
A new and larger Shear-Speed external shaper, Model 18103, capable of cutting gears, toothed clutches and other external shapes up to 10 in. OD and 2-3/4 in. thickness is the latest addition to its Shear-Speed line by Michigan Tool Co., Detroit 12, Mich.

The machine takes a floor space 86½ in. by 78½ in., and is 123 in. in height. Powered by a 30-hp electric motor, it will handle work from seven in. to ten in. OD, or with special liners it will take work as small as five in. in OD. Maximum stroke on the machine is three in.

Cutting all teeth in a gear simultaneously, it is recommended by the manufacturer for gears or involute splines from five pitch to 12 pitch. It will also cut straight sided splines, sliding clutches, ratchets, inverted splines and other external shapes. These can be cut individually or stacked and cut in multiple units where this is feasible.

A new feature of the 18103, also being applied now to the other three Shear-Speed models, is the method of automatically locking the head in cutting position. Hydraulic actuated wedge pins provide instantaneous and positive locking of the head when it

is lowered in cutting position by engaging a similar angular wedge surface on the two outer extremities of the head of the machine. Angle of the wedge surface on both the pins and the corresponding wedge surfaces on



Michigan Model 18103 Shear-Speed external shaper

the head is said to allow locking in the desired cutting position with only a simple initial adjustment of the head stop.

J-74—Multi Driller and Tappers

A new line of high-speed, sensitive multi-drillers and tappers has just been introduced by the National Automatic Tool Co. of Richmond, Ind. This new line consists of heavy duty and light duty Model H-5 and H-6 multi-spindle drillers and tappers and replaces the standard G-5 and G-6 models.

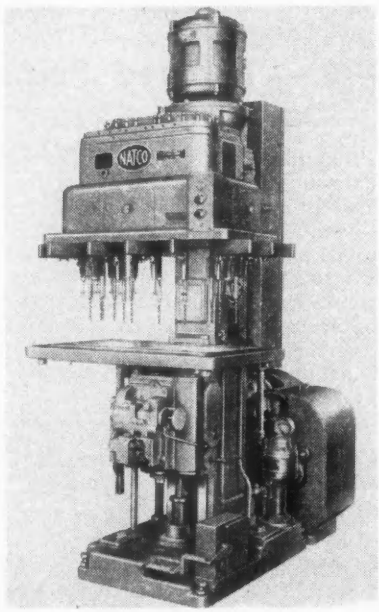
The NATCO Model H-5 and H-6 high speed sensitive multi-drillers or tappers are of similar design, and vary only with regard to the size of the drilling area of the head, horsepower of head drive motor, number of spindles in the head and size of work table. They will handle a wide range of small and medium-sized work.

These machines may be furnished as a driller only, as a tapper only, or as a combination driller or tapper. Operating efficiency has been given the first consideration in the design of these machines. They are provided with change gears and a quick change speed mechanism for correct spindle speeds. A vertical adjustment on the spindles compensates for the grinding of drills or the use of different length drills, and a feature in the design of the spindle proper permits float for tapping operations. They are equipped with a reversing motor drive.

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58

The NATCO Model H-5 may be furnished with a 7 in. by 12 in. rectangular drilling area head, and is provided with twelve ¾-in. diameter upper joint drives. The NATCO Model H-6 may be furnished with a 10 in. by 24 in. rectangular drilling area head provided with twenty-four ¾-in. diameter upper joint drives. Both heads are regularly equipped



NATCO multi-spindle driller and tapper with hydraulic feed

with the independent change of spindle speeds which provide two speeds and neutral for each spindle.

The H-5 and H-6 models are available with either hydraulic feed or hand and foot feed.

J-75—Resistance Welding Light-Duty Holder

A new leak-proof, ejector type, light-duty holder design has just been developed by P. R. Mallory & Co. of Indianapolis 6, Ind. The holder is arranged so that the water circuit forces water against the head of the electrode tip regardless of length, and the water circuit is sealed so that there is no leakage to create a rust problem on the work.

Tip removal is simplified and tip damage minimized by the use of an ejector plug. The complete holder barrel is made of Mallory No. 3 Metal, an alloy having high electrical conductivity and physical strength. It is stated that the use of this metal insures longer life in rough service.

J-76—Cylinder Head Volume Tester

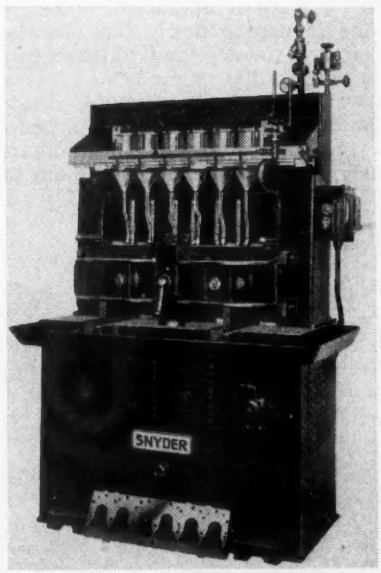
A special machine has been designed and built by Snyder Tool & Engineering Co., 3200 E. Lafayette, Detroit, for testing automotive cylinder head volume. Production is 60 pieces an hour at 80 per cent effiency.

The cylinder head unit is clamped in the fixture by air-operated toe clamps which engage the four corners of the part, and by a latch clamp which is manually positioned and clamped over the center of the part.

The operator opens a valve which fills the series of metering glasses along the top of the machine with compound-treated water, then opens each glass and allows the liquid to pass into the cylinder head combustion chamber. This liquid, rising in the glass gages registers the volumetric content of each combustion chamber.

Because air bubbles remaining inside the cylinder head would give an appreciably inaccurate reading, the liquid is brought into the combustion chambers in such a way that all air is displaced.

At the completion of the metering cycle, liquid is drained into a tank and pumped up to a reservoir above the metering glasses.



Snyder machine for testing cylinder head volume

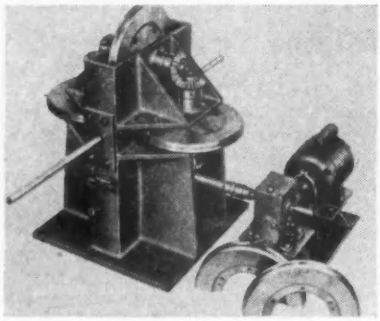
NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58.

J-77—Device for Marking Tubing

Manufacturers of seamless and light-wall aluminum, copper and brass tubing can now mark up to four sides of their products at production-line speed with a new marking device offered by Pannier Bros. Stamp Co., Pittsburgh, Pa.

The Pannier "Master Marker" universal marking machine stamps one, two, three or four sides on the same run at a rate up to 300 fpm. It



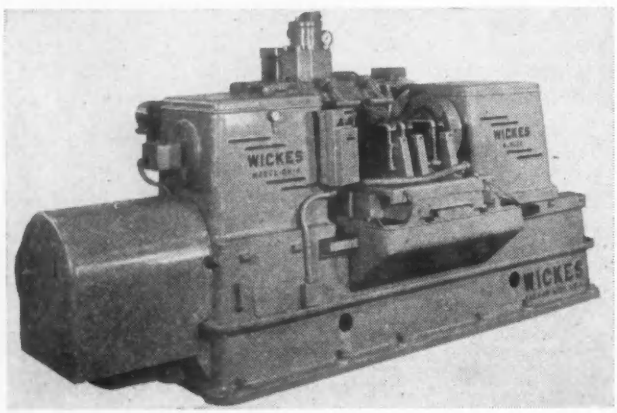
Pannier Master Marker

handles bars, as well as tubing, in round, square, hexagon and other shapes, and in sizes from ⅜ to two-in. diameter. Portable or stationary, and equipped with a 1/3 hp motor, it can be used for production or job work. It has replaceable segments, and interchangeable type, if required. Character size depends on requirements of the product marked. The weight of this new Pannier marking device is about 700 lb complete.

J-78—Double End Drive Turning Machine

A double end drive crankshaft turning machine just designed and manufactured by Wickes Brothers, Saginaw, Mich., uses all carbide tools for high speed operation. The machine is arranged for the operation of rough turning and finish turning the outside diameter of the six counterweights as well as rough turning and finish turning clearance chamfers on the six crankarms, all simultaneously, on a four-throw, five main line bearing, V-8 type forged crankshaft. It is completely automatic and capable of producing 35 crankshafts per hour net.

The new Wickes machine is provided with front and rear cam-operated angular cross slides as well as longitudinal turning slides mounted in the back tool housing. Hydraulic feed is provided to all tool slides. The machine is powered by a 40-hp main drive motor and has a net weight of approximately 27,000 lb.

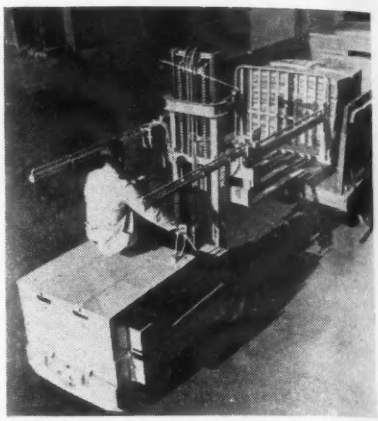


Special crankshaft turning machine made by Wickes Bros.

J-79 — Imroved Pusher Device

Simplified design, more efficient hydraulic operation and rugged construction with considerable decrease of weight are features of the improved pusher device for use on Clark fork trucks, according to the Tructractor Division of Clark Equipment Co., Battle Creek, Mich. For handling material in cartons and bags, in instances where material must be removed from pallets, the pusher makes it easy to remove the load as a unit rather than piece-by-piece.

In the newly designed pusher, the pusher rack which travels horizontally to move material off the forks, is connected to two hydraulic cylinders which receive equalized hydraul-

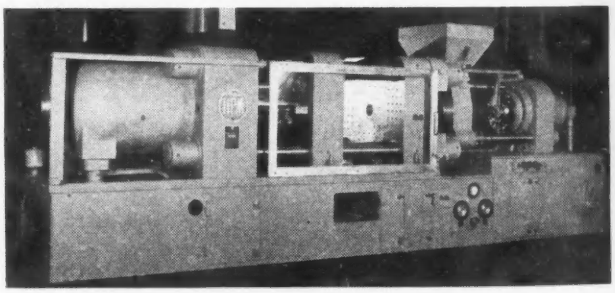


Pusher device mounted on Clark truck

ic pressure through a flow divider. The cylinders are supported by two horizontal slide channels mounted on roller bearings, with the result that the rack travels smoothly and evenly in both directions. Side guard members provide protection to slides and cylinders.

J-80 — Large Capacity Molding Machine

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has brought out a large-capacity thermo-plastic injection molding machine, capable of molding 40 oz of acetate or 32 oz of polystyrene per cycle. It molds all types of thermo-plastic material. Vinyl-vinylidene chloride requires a special alloy heating chamber.



H-P-M 40-oz injection molding machine

The new H-P-M 40-oz injection machine is entirely automatic. Only the removal of the molded parts is required by the operator after they have been automatically ejected from the mold.

This H-P-M 40-oz injection machine weighs 82,000 lb, and is 264 in. long and 60 in. wide. The heating chamber for plasticizing molding material is over 3 ft long. Two H-P-M Hydro-Power variable displacement radial, piston-type hydraulic pumps generate the hydraulic pressure.

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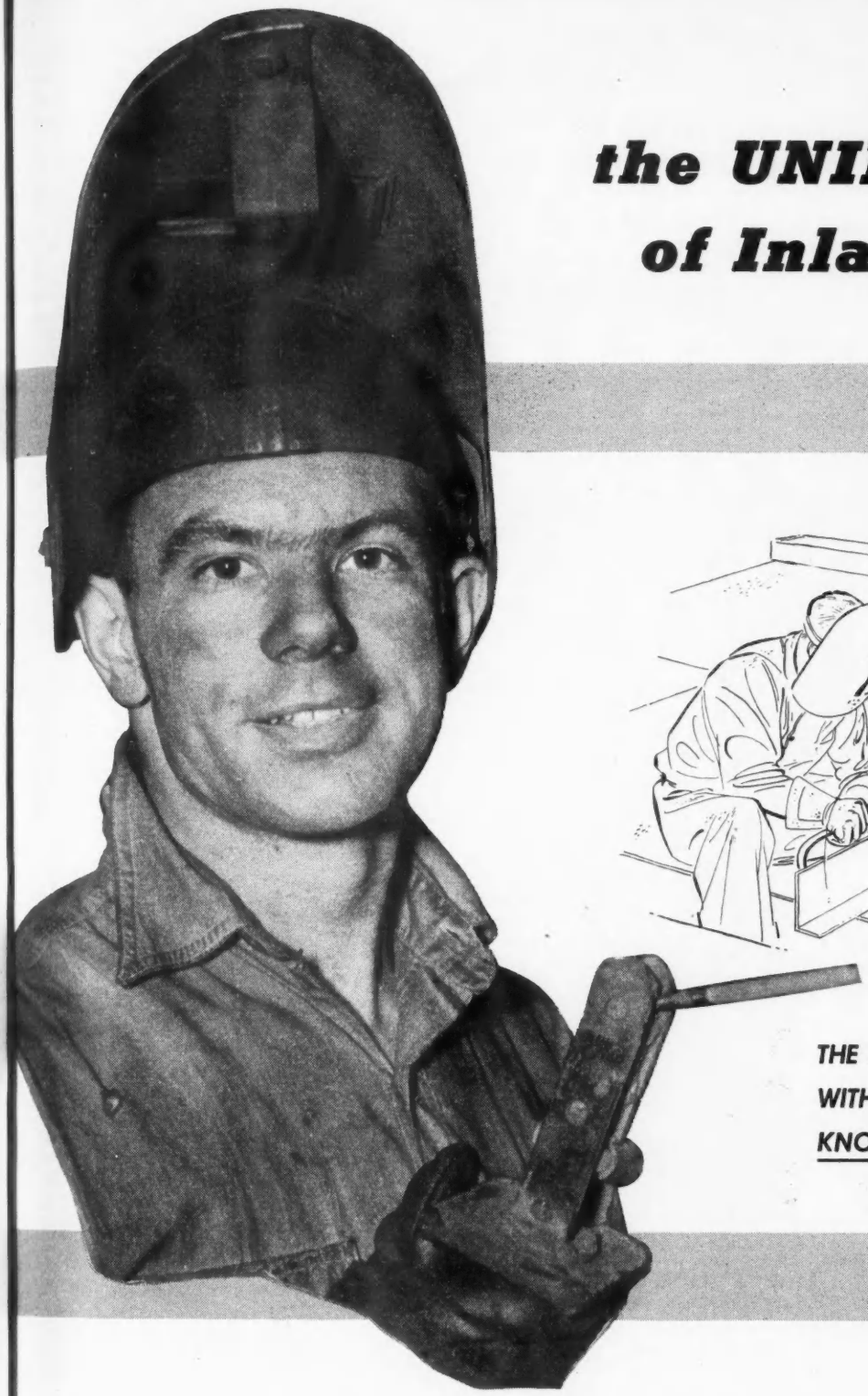

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K-72—Measuring Device

The fineness of textile fibers (animal, vegetable and synthetic) can be accurately measured and classified by the Micronaire, a new product of the Sheffield Corp., Dayton, Ohio, in a fraction of the time formerly required. It is said that two tests per sample can be made in two to three minutes. Repetitive accuracy is within 0.1 micrograms per inch on cotton, the most varying of textile fibers. Accuracy is even higher with other types of fibers.

The Micronaire utilizes the principle of forcing air through a plug of fibers and indicating the resistance to the air flow, thus indirectly measuring the degree of fiber fineness.

Sheffield Micronaire

Fine fiber stock offers more numerous air passages, but the average openings between the fibers are smaller. Therefore the resistance offered to the flow of air is greater for fine than for coarser fibered stock. Direct readings are made from a scale calibrated in units standard for the fiber being checked.

The Sheffield Micronaire, as now developed, is a standardized instrument with necessary adjustments and interchangeable accessories for measuring textile fibers on a commercial scale.

K-73—High Sensitivity Galvanometer

A new Type E galvanometer just brought out by Leeds & Northrup, Philadelphia 44, Pa., has its moving system, magnet, lamp, scale and lamp transformer in a single, compact case. The user places the instrument on a bench or table, plugs into a 115-volt, 60 or 50 cycle outlet, and it's ready to use.

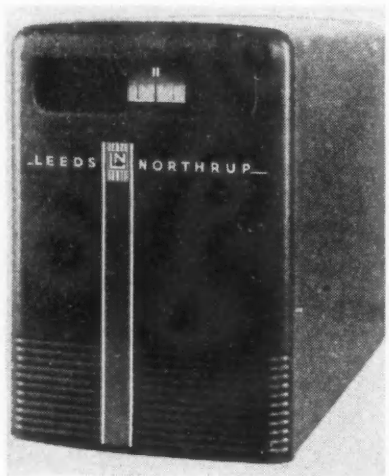
Sensitivity of these instruments is said to be ample for many potentiometer and bridge circuits which formerly required L&N galvanometers having separate reading devices. Available sensitivities are 0.5 microvolt, 0.005 and 0.0005 microampere per mm. Period is only about 3 seconds.

NEW ★ PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

In addition to amply high sensitivity for such work, this instrument has, in effect, an added low sensitivity which is a great help in initial stages of measurement. If a deflection shoots the galvanometer's indicating light-spot off scale, a secondary spot appears. Moving only one-tenth as far as the main spot, this secondary spot shows direction of deflection and approximate magnitude of circuit-balancing adjustments.

The instrument's scale has fifty 1-mm divisions on either side of zero.



Leeds & Northrup Type E galvanometer

Deflection is linear within one per cent.

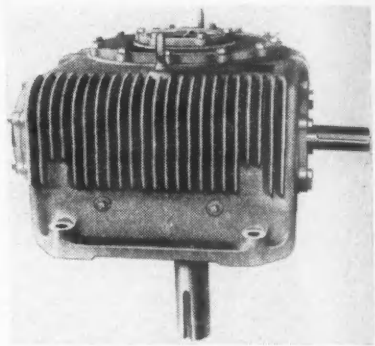
Zero is adjusted by turning a knob on the front of the instrument. The metal case provides electrical shielding.

K-74—Speed Reducers

A standard series of seven-in. center distance speed reducers, Series 7700, in ten standard ratios from 5:1 to 70:1 has been added to its stock line of heavy duty right-angle reducers by the Cone-Drive Division of Michigan Tool Co., Detroit 12, Mich. The new series is an intermediate size and is available in three types: HU-7700, with pinion under the gear; HO-7700, with pinion over the gear; and HV-7700, with gear shaft vertical. All ratios and types also are available with double extended gear shafts or double extended pinion shafts.

These seven-in. reducers have mechanical horsepower ratings ranging from 1.56 hp at 100 rpm for the 70:1 ratio to 94.2 hp at 2400 rpm of the pinion for the 5:1 ratio.

At the same time, it is announced that standard seven-in. center distance gear sets similar to those used in the 7700 series reducers, together with standard bearing mountings and carriers, are available where it is desired to incorporate the gears in specially designed housings in locations which do not lend themselves to the use of standard reducers.



Cone-Drive HV-7700 speed reducer

K-75—Antisep All Purpose Base

E. F. Houghton & Co., Philadelphia, Pa., announces its latest development for the metal-working industries—Antisep All-Purpose Base. This new product, partially described by its name, is high in both sulphur and saponifiable content. It can be diluted with either oil or water and used as a soluble oil on even the most difficult machining operations, according to the manufacturer. Its chemical properties are not changed, even when diluted with a high percentage of water.

Some of the advantages of the new base, in addition to those mentioned above, are said to be: Excellent refrigerating qualities, allowing high machine feeds and speeds, better finish, cool work, longer tool life and no "blue" rejects; satisfactory lubricating properties, even with water, to protect bearings and spindles of automatics; high rust preventive properties, preventing corrosion, staining or pitting of parts; antiseptically treated, it will not promote the growth of bacteria or turn rancid in machines or storage; because of its ready emulsibility with water, it is easily cleaned from the work.

Antisep All-Purpose base can be used in more than 90 per cent of metal cutting and forming operations, including general machining, stamping and drawing.

(*Turn to page* 60, *please*)

The THREE NECESSITIES

. . . FOR LEAK-PROOF, PRESSURE-TIGHT UNIONS

FORM-A-GASKET No. 1 (a paste) sets fast but not too fast for use on large surfaces. It dries hard but does not become brittle. It's a swell product for making pressure-tight, leak-proof unions . . . even when the surfaces are warped.

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AVIATION FORM-A-GASKET No. 3 (a brushable, self-leveling liquid) sets into position and dries to a tacky paste. It will not run, even when heated to 400° F. . . . nor will it become hard or brittle down to 70° F. below. Especially useful on threaded pipe and rubber hose connections. Prevents corrosion and cylinder head seizure.

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PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

H-84—Bearing Load Computation

New Departure Div., General Motors Corp.—Bearing Load Computation, a new book for engineers, has been announced by the company. It is a complete, easy-to-use arrangement of bearing load computation data. It contains an explanation of the process of computing bearing reactions, followed by typical examples numerically worked out for various types and arrangements of gears.

H-85—Cutter and Tool Grinder

The Cincinnati Milling Machine Co. —Publication No. M-1618 describes the No. 2 Cutter and Tool Grinder. The machine is pictured. Highlights of design are listed, information on attachments, general specifications, dimensional drawings and standard equipment are also included.

H-86—Asbestos Textiles

Johns-Manville Corp. — A new 16-page brochure, Johns-Manville Asbestos Textiles, is available. It lists many uses for asbestos textiles in industry. Descriptive material is accompanied by tables of specifications for each produet.

H-87—Tournahauler

R. G. LeTourneau, Inc.—A new 6-page illustrated folder, RT-149, describes the company's latest addition to its line of equipment, the Tournahauler, a heavy-duty, self-powered hauling unit. Application photographs are included, together with specifications of the unit.

H-88—Pre-Finished Nickeloid Metals

American Nickeloid Co. — A new booklet featuring the widespread use of pre-plated Nickeloid Metals has been issued. It is well illustrated with photographs of products utilizing these metals. Illustrated also are the various forms in which Nickeloid Metals are offered, sheets, coils, etc. A number of pages are devoted to listing the physical properties of the various metals. Also listed are sheet sizes, tempers, gauges, and a handy table of decimal weights.

H-89—Metallizing

Metalweld, Inc. — A new leaflet tells how metallizing (the Metalweld process of metal spraying) is used by industry for making mechanical repairs and rebuilding worn machinery. Information is also given on corrosion and contamination protection of surfaces.

H-90—Arc Metal Cutting Tool

Eutectic Welding Alloys Corp.—A new illustrated 8-page bulletin describes CutTrode, an arc metal cutting tool. Complete information, technical diagrams, instructions for using CutTrode is given. Operating hints are outlined. Application photographs are included and the bulletin contains application information for several popular welding rods.

H-91—Gear Materials

The International Nickel Co., Inc.—Modern Trends in Nickel Steel and Cast Iron Gear Materials is the title of an illustrated technical booklet that discusses the important factors contributing to the smooth operation and long life of modern gears. In it also is compiled valuable data and charts on the compositions, physical properties, heat treatment and machinability of gear metals.

(Turn to page 90, please)

TIME SAVER COUPON for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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NEW PRODUCTS

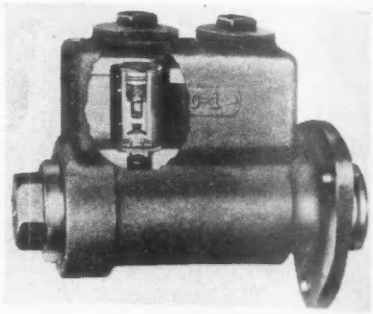
(*Continued from page* 56)

K-76—Two New Brake Developments

Minnesota Automotive, Inc. of Minneapolis, Minn., has a power brake cylinder for use on trucks with hydraulic braking systems. This cylinder supplies the trucks with more than twice the braking power of the conventional master cylinder. Instant, positive pedal control, few moving parts, minimum maintenance and elimination of dust and temperature hazards are among the factors featured by this new brake cylinder, according to the manufacturer.

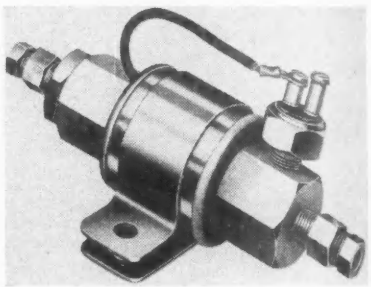
The braking power of the Mico power brake cylinder progresses while in mid-action from that of a conventional or low pressure cylinder to that of a high pressure cylinder, thereby more than doubling the line pressure. The braking load is transferred from low to high pressure at a predetermined point, thus synchronizing the action of the Mico cylinder with the working conditions of the braking system.

The simple construction of the Mico unit, using one high pressure cup and one low pressure cup, is made possible by the Mico relief valve. This valve allows excess oil to flow into the oil reservoir at any desired pressure and to flow back into the cylinder when the brake is released.



Mico power brake cylinder

Another new development of Minnesota Automotive, Inc., is a device that converts any hydraulic braking system into an emergency brake lock. Known as the Mico brake lock, it is electrically actuated and controlled from a switch mounted on the instrument panel. A small amount of current is drawn from the battery only during the time the driver depresses the brake pedal. Once applied, the Mico brake lock does not depend on any electrical current for its holding power. No electrical current is consumed during the releasing operation.



Mico brake lock

K-77 — Improved Skip-Numeral Print Wheel

An improved skip-numeral print wheel which, when used with strip chart electronic recorders, permits symmetrical and well-defined multiple measurement records has been developed by the Brown Instrument division of Minneapolis-Honeywell Regulator Co., Philadelphia 40, Pa.

The new skip-numeral print wheel overcomes a crossing of records and superposition of numerals of any one record. The new skip-numeral wheel utilizes the same basic system of plus and numerical identification. It also

(*Turn to page* 62, *please*)

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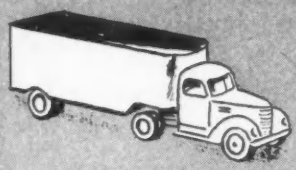

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Scores of users have found that they save time, trouble and money by turning their electrical wiring harness problems over to Essex specialists.

Essex *One-Source* service handles the intricate job of producing lighting, ignition and control harness assemblies *custom-built* to your exact specifications and *complete* with all manual and electrical control devices for quick, efficient installation.

Through intensive specialization in wiring harness assemblies, Essex has developed line production methods of manufacturing, assembly and inspection, for economical production of high grade, individually tested, specially engineered assemblies.

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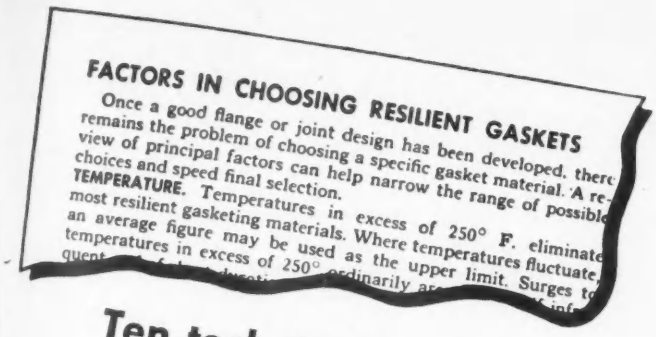
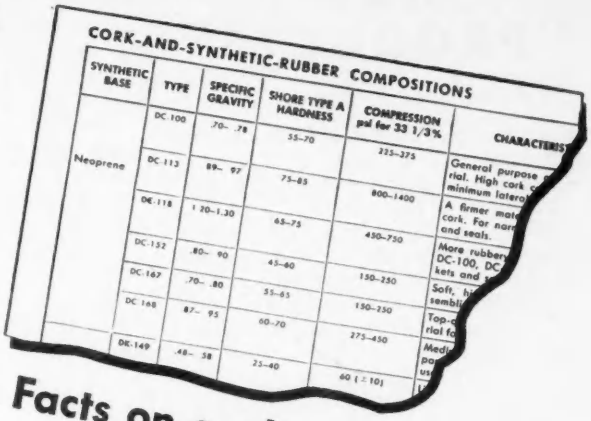
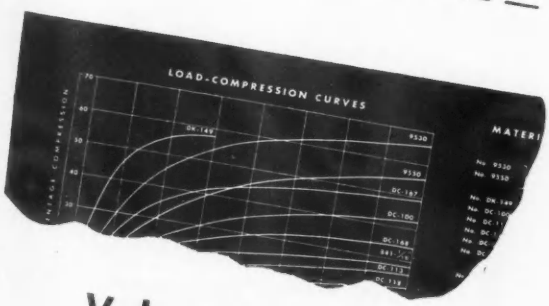

FACTORS IN CHOOSING RESILIENT GASKETS
Once a good flange or joint design has been developed, there remains the problem of choosing a specific gasket material. A review of principal factors can help narrow the range of possible choices and speed final selection.
TEMPERATURE. Temperatures in excess of 250° F. eliminate most resilient gasketing materials. Where temperatures fluctuate, an average figure may be used as the upper limit. Surges to temperatures in excess of 250°

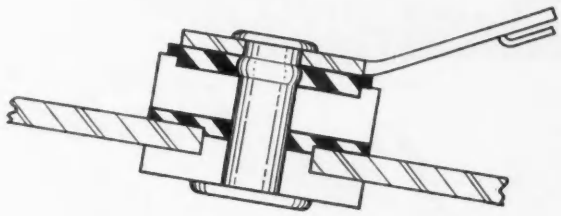
Ten technical discussions



Facts on gasket materials



Valuable charts



Typical applications

These gasket data . . . Free!

Here's a handy "working tool" for men who use gaskets in the equipment they buy, design, or build. There are 20 pages full of up-to-the-minute information on resilient sealing materials in the new Armstrong's Gasket and Sealing Materials booklet. And it's yours for the asking.

Ten technical discussions of the variables influencing the design of gaskets and gasketed joints are liberally illustrated with charts. You will also find physical data and typical applications of the major types of sealing materials offered by Armstrong—cork compositions, cork-and-synthetic rubber compositions, synthetic rubber compounds, and fiber sheet packings.

Get this valuable booklet for your files now. Write for your free copy of Armstrong's Gasket and Sealing Materials to Armstrong Cork Company, Gaskets and Packings Department, 1504 Arch Street, Lancaster, Pa.

ARMSTRONG'S GASKETS • PACKINGS • SEALS

NEW PRODUCTS

(*Continued from page* 60)

staggers the numeral locations for different records permitting use of slower chart speeds.

The use of slower chart speeds, it is said, permits a substantial chart economy while maintaining greater clarity and permanency of recorded measurements, particularly when used in conjunction with standard charts made for the electronic recorders.

K-78 — Thermistors Added to G-E Line

G-E Thermistors, electrical semiconductors that respond to temperature variations as small as one thousandth of a degree Centigrade, have been added to General Electric's line of metallurgical products, according to the Metallurgy Division of the Company's Chemical Department. The devices are made from mixtures of semi-conducting metallic oxides and possess a high negative temperature coefficient.

Available in the form of rods, disks, and beads, G-E Thermistors are especially adaptable as the sensitive element in flow meters, time delay relays, switching devices, and other types of indicators and controls. Since they are pure electrical resistances, they can be used with either alternating or direct current.

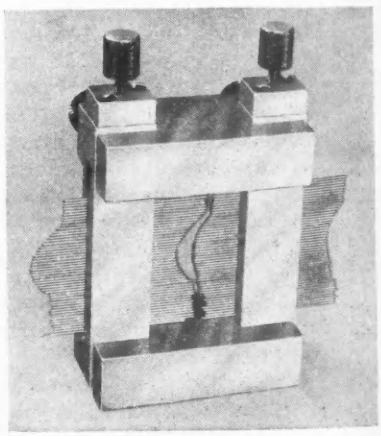
G-E Thermistors may be actuated either by ambient temperatures or by internal heating of the element. By means of systems employing G-E Thermistors, temperature variations may be transmitted automatically to distant locations.

The negative coefficient of resistance of G-E Thermistors may be used to offset the positive coefficient of resistance of conventional types of electrical conductors, and they can be used in instruments, meters, or other circuit components to correct errors caused by extreme temperature conditions.

K-79 — Simple Contour Transfer Gage

A simple contour transfer gage is offered by Thompson Products, Inc., Cleveland, Ohio, through its Accessories and Parts Division. The gage can readily be used for the measurements of any radius or contour where other standard measuring devices are not applicable. It can be applied with equal facility and accuracy, both to checking die cavity contours and production line parts.

Essentially, the contour transfer gage provides means for reproducing many curves, which are difficult to



Thompson contour gage

gage directly, in a readily measureable form. In conjunction with an optical comparator, the gage permits a rapid, simple setup for checking dimensions. A dial indicator or height gage can readily be used if desired.

The gage pins are sized within 0.0002 in. making it possible to check contours directly on the comparator by using the opposite end of the pins.

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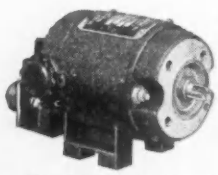
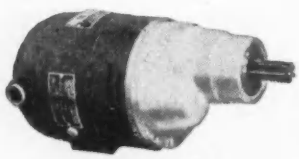
Lamb Electric MOTOR



Compactly designed motor developed for metering pump and special instrument service.



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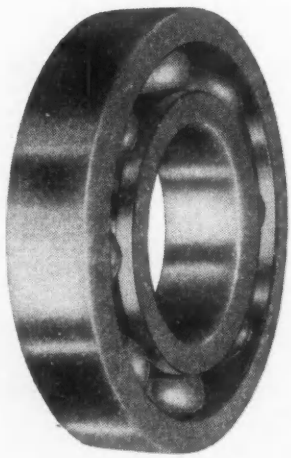

BEARINGS COMPANY OF AMERICA
LANCASTER, PENNSYLVANIA

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Business in Brief

Written by the Guarantee Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

Further moderate reductions in general business activity are indicated. The *New York Times* index for the week ended March 20 stands at 147.9, as against 151.4 for the preceding week and 146.7 a year ago.

Sales of department stores during the week ended March 20, as reported by the Federal Reserve Board, equaled 312 per cent of the 1935-39 average, as compared with 278 in the week before. Sales were nine per cent above the corresponding distribution a year earlier, as against a preceding similar excess of four per cent. The total in 1948 so far reported is six per cent greater than the comparable sum in 1947.

Electric power production declined slightly in the week ended March 20. The output was 8.1 per cent above the corresponding amount in 1947, as compared with a similar advance of 10.9 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 700,482 cars, 12.1 per cent less than the figure for the week before and 17 per cent below the corresponding number recorded in 1947.

Crude oil production in the week ended March 20 averaged 5,240,250 bbls daily, or 24,600 bbls less than the preceding average but 378,650 bbls above the comparable output in 1947.

Production of bituminous coal and lignite during the week ended March 20 is estimated at 4,350,000 net tons, 67 per cent less than the output in the week before. The total production in 1948 so far reported is 11 per cent below the corresponding quantity in 1947.

Civil engineering construction volume reported for the week ended March 25, according to *Engineering News-Record*, is $137,910,000, or 53 per cent more than the preceding weekly figure and 129 per cent above the comparable sum in 1947. The total recorded for thirteen weeks of this year is 20 per cent more than the corresponding amount in 1947. Private construction is 18 per cent below that a year ago, but public construction has increased by 96 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended March 20 is 161.5 per cent of the 1926 average, as compared with 159.8 for the preceding week and 149.0 a year ago.

Member bank reserve balances decreased $481 million during the week ended March 24. Underlying changes thus reflected include an advance of $242 million in Reserve bank creidt and an increase of $781 million in Treasury deposits with Federal Reserve banks, accompanied by a decline of $69 million in money in circulation.

Total loans and investments of reporting member banks declined $372 million during the week ended March 17. A reduction of $16 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $14,578 million shows a net increase of $2,370 million in 12 months.

Aluminum Replaces Steel

(*Continued from page* 43)

The most impressive cost saving has been made in the running board. In the previous design the running board was a steel stamping which, after forming and cleaning, was coated with a rubber tread. In addition, the under side, exposed to the weather, was painted for protection; and finally the edge of the board was finished off with a stainless steel molding.

The aluminum board, on the other hand, represents a study of engineering economy. It is made of embossed strip stock which provides a non-skid pattern in the raw material, as received, at practically no extra cost. Once the strip has been suitably blanked and flanged, no further processing is required. The elimination of rubber bonding, cleaning, and painting operations represents considerable saving and marks an application that helps to pay for other parts where the relative cost is not as favorable.

The headlamp housing is another example of cost economy. While it is a deeply drawn part, it was found possible to use the same press dies as for steel, simply by the adoption of a special drawing compound more suitable for aluminum. In press practice, aluminum "flows" rather than "stretches" as in the case of steel, since aluminum is not as ductile. Accordingly, the only change in practice is to relieve blankholder pressure slightly so as to permit the aluminum blank to move into the die so as to permit the metal to "flow."

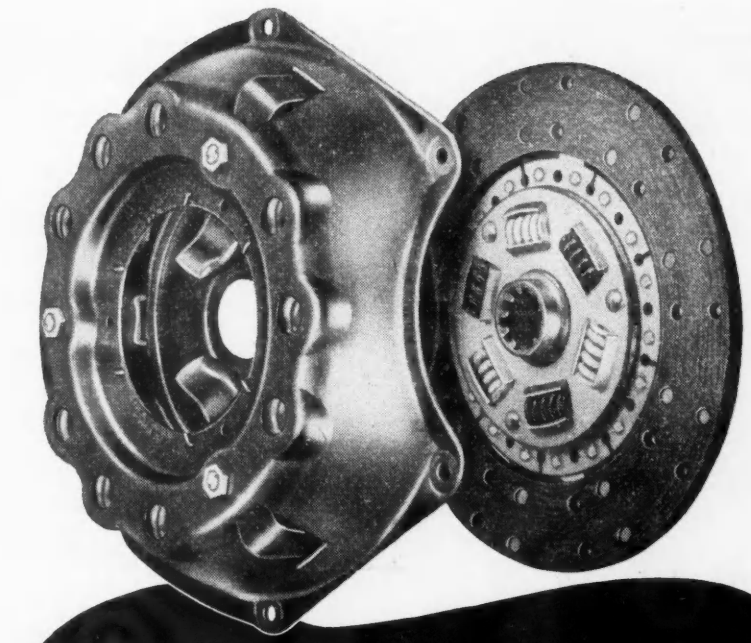
With the steel headlamp housing it was necessary to process the parts through equipment to produce a phosphate coating, then paint so as to develop the necessary corrosion-resistance. The aluminum part, on the other hand, is used without any coating whatever. The major cost saving, therefore, is reflected in the elimination of the two process operations.

Similarly, there is a tangible cost saving in making the voltage regulator cover in aluminum. Here the part exactly replaces the former steel part but eliminates the extra operation of zinc plating for appearance and corrosion resistance. In fact the aluminum part has a more decorative appearance at a saving in cost. This illustrates another principle in selecting aluminum applications since it is feasible to eliminate painting or chemical coatings for underhood parts without penalizing corrosion resistance, yet giving still better appearance value.

The headlight ball ring is another interesting part that will be in production soon. It replaces steel and, as in the case of the voltage regulator, eliminates the zinc plating. It also represents one of the few parts that requires welding, in this instance the formed ring being butt-welded at the joint. Here the cost saving is not as appreciable because the press operations and welding are somewhat more expensive than with steel.

Another part requiring minor welding is the air cleaner, made by a vendor. About 50 per cent of the weight of steel parts has been eliminated, the remaining steel elements—the mounting flange and bottom bowl—being retained.

What bars these applications for the moment is the problem of welding and the necessity for new welding equipment. Further study with the possibility of finding a short-cut method on one part or another may remove one or more of these parts from the doubtful column.



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ENGINEERING BW PRODUCTION

Lighter and Stronger Car Bodies

(*Continued from page* 48)

structure, it was found that the bending strength and rigidity were increased approximately 15 per cent and that the torsional strength and rigidity were increased approximately 25 per cent. Also, the gross structural weight of this first modified structure was 830 lb as compared to the original structural weight of 940 lb. This amounted to 110 lb or approximately a 12 per cent structural weight reduction, but still gave a stronger structure.

This design was by no means the ultimate, with its many parts and overstrength characteristics. It was a design that can be more or less classed as a preliminary structural investigation to determine the feasibility and advantages of such a structure.

The second design, also controlled by the factors outlined for the first design, was an attempt to establish a structure with fewer parts and also to reduce the overstrength of the first design. Starting off with the original structure from which the frame and side sills had been removed, two C section channels of 0.050 in. gage were installed to extend from approximately station 90 forward to the front bumper attachments, as shown in Fig. 6. The channels were attached integrally to the 0.042 in. forward floor pan and, by flanging down the outboard side of the floor to meet the foot step or running board, a complete fore and aft integral closed box structure was formed.

Since it was desired to have the roof structure carry load, the shear web and upper sill reinforcement of the first design was retained. The remainder of the basic structure aft of station 90 was relatively simple. From the required moments and shears, the only additional structures needed were two angles of ¾ by ¾ by 0.072 in. gage. One of these angles was attached to the lower edge of the quarter panel and integrally attached to the forward channel sections. The other angle followed the roof flange and was integrally attached to the upper sill and extended down to meet the lower fore and aft quarter panel angle.

So far the structure was satisfactory fore and aft, but possibly understrength transversly. Starting from the critical section (through the center of the body) there were rear engine mount loads, drag loads from the rear wheels, seat loads and torsion to be considered. The fore and aft channel sections supported the seats and carried part of the drag load from the rear springs. The forward and rear floor pan (with transverse beads) rigidly attached to the channel sections stabilized the body for torsion, and in addition two drawn beads in the forward floor running diagonally from the outboard side at station 90 to the rear engine mount helped to distribute rear drag forces and to aid the rear engine support. This drawn bead in the floor was closed off with a plate to form a box section. This close-out was necessary to maintain torsional strength characteristics. The only transverse structure needed then was a small beam of 0.042 in. gage at the rear engine support and a transverse ring at approximately station 120 to meet the flange around the rear window. The rear floor pan was flanged down at the rear to form an additional box for torsional rigidity. Forward of station 30, load structure consisting of channel sections were at-

(*Turn to page* 70, *Please*)

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Lighter and Stronger Car Bodies

(*Continued from page* 68)

tached to the fore and aft beams forming a box section. This section was then utilized for front engine support, steering mechanism support and spring support. This completed the basic structure.

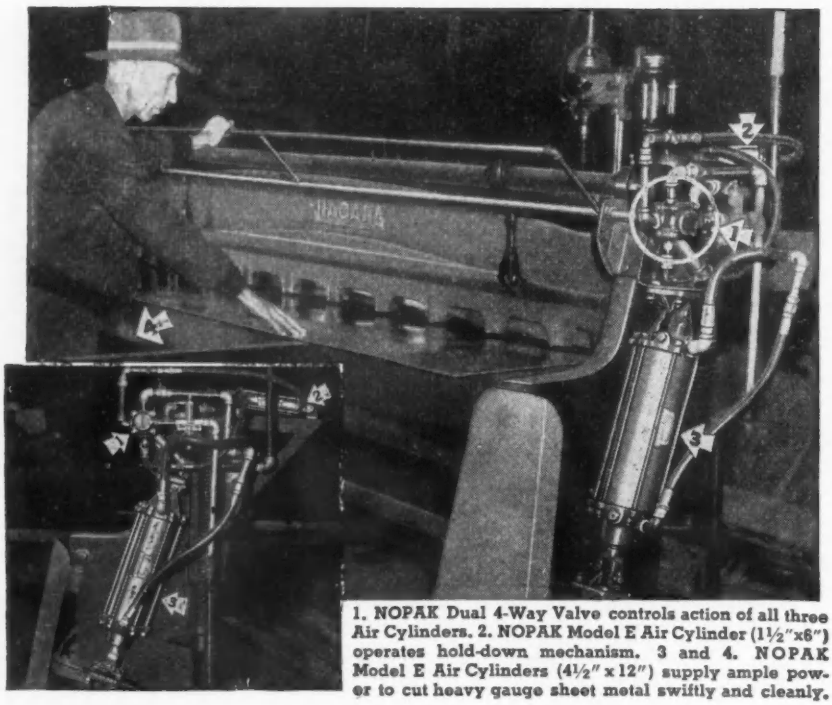
For this second design, controlling factors of passenger and chassis arrangement, contour and materials were still held. From a structural analysis, this structure was designed closer than the first design, resulting in the bending and torsional strength and rigidity being equal to the original model. The weight analysis gave a gross structural weight of 780 lb as compared to the original 940 lb. This amounted to a decrease of 160 lb, or approximately a 17 per cent structural weight reduction without loss of any strength characteristics. This design eliminated the overstrength, reduced the number of parts, but still retained one or two possible disadvantages, such as roof rail reinforcement and aft ring attachment. Studies of this design could possibly relieve these disadvantages. Also, with the necessary tooling and assembly techniques it could be adapted to quantity production.

There are other possibilities of using aircraft structural practices for automobile designs. For a third design, all primary structure of the automobile was placed in the underbody, and the roof was not utilized for carrying any load. This structure was mainly a master torque box, and consisted primarily of an upper and lower skin and two stabilizing bulkheads. The upper skin, 0.042 in. gage, with reinforced edges acted as the floor of the car, and consisted of a formed sheet incorporating the top, ends and sides of the box. The lower skin, also of 0.042 in. gage, was a close-out sheet with stabilizing beads and a formed depression in the rear for the fuel tank. The stabilizing transverse bulkheads were of 0.042 in. gage C sections located approximately at the front and rear door pillars. A turnover ring located approximately at the rear door pillar was required for passenger safety under turnover conditions. The ring was a hat section of 0.050 in. gage approximately two in. square, extending from the torque box up the rear door pillars and across the roof. In addition to the above structure, local rienforcement was required at load concentration points such as engine, seat, spring and bumper attachment.

A preliminary analysis of this design showed that the bending strength would be equivalent to the original structure, and that the torsional strength would be increased approximately 35 per cent. The structure weight saving was approximately 50 lb. A design like this would eliminate the front door pillars, thus increasing forward and angular visibility, and would prevent the roof structure from carrying any load. In addition, this structure would be ideal for convertible-type cars as well as other body styles because the body would have no primary structural function and could be designed light and in any simple manner.

A summary of the three designs is given in Table I, and shows that all three designs equal or exceed the structural requirements of the standard passenger car, and in addition show an appreciable weight saving. If the designs were unrestricted (allowed to change material, contour, suspension, engine location) it is very likely that the structural efficiency could be increased further.

The foregoing article was abstracted from the paper "Aircraft Structural Design Practice Applied to Automobile Design," which was presented at the recent convention of the American Society of Body Engineers in Detroit.



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Cutting cycle is now many times faster, strain and fatigue are eliminated, workmanship improved. Expect similar results on your *machines* through the use of NOPAK Valves and Cylinders for the application of air or fluid power.

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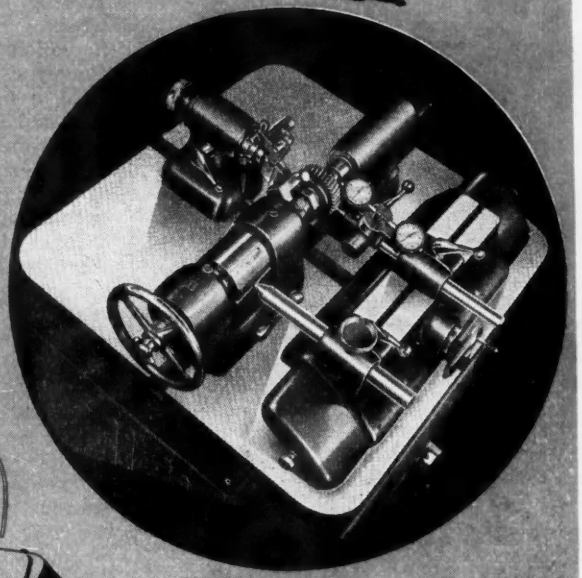

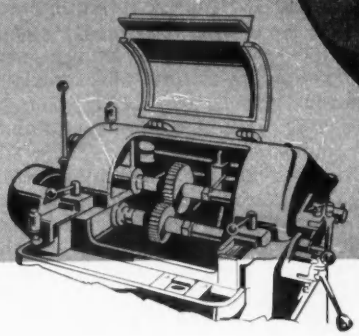

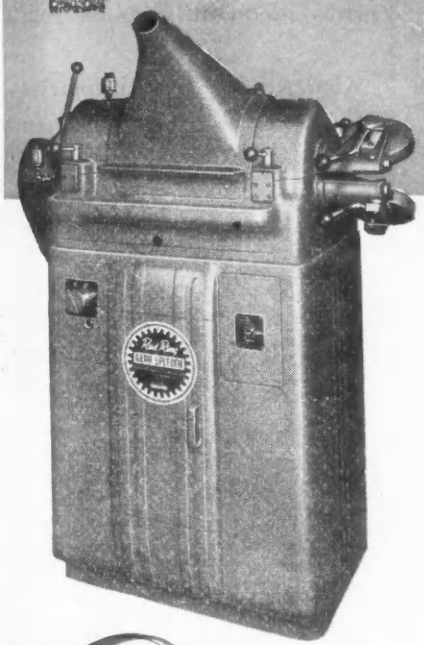

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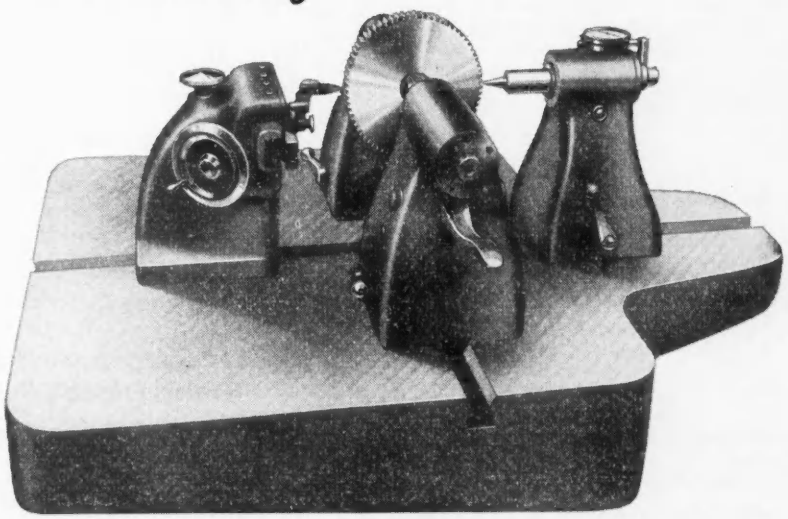

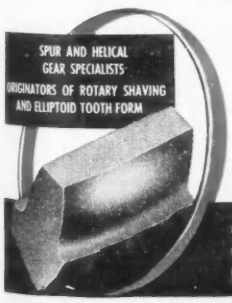

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New Six-Cylinder Hudson Engine

(*Continued from page* 36)

rolled over to rest on its bottom face and enters an Ingersoll Mill where a light cut is taken on the top face to get a good flat surface for the cylinder head gasket. At the same time the cylinder bores are chamfered. Detail operations on the valve guide bores and valve seats then follow, including the grinding of valve seats in the newly installed Hall grinders.

In its course on the machine line the block is washed at least two or three times at various stages. Also, Hudson has just installed a unique washing machine, the Centri-Spray, in which the blocks are loaded on a conveyor that threads through the washer for a thorough cleaning inside and out. The conveyor is fitted with rotating type work-holding fixtures designed to turn continually by means of a sprocket at the end of each fixture which is in contact with a chain along the conveyor line. Thus the block is turning constantly while being impinged by streams of cleaning fluid.

The foregoing describes the high-spots of the new six-cylinder engine line only. The eight-cylinder block is machined in somewhat similar fashion in another department, and the two blocks meet at the final assembly line following initial subassembly operations. It is at this junction that the new Gisholt Dynetric balancing machines are installed. Their function is to assure a dynamic balance of the entire reciprocating assembly of crankshaft, flywheel, and piston and rod assemblies. Each of these items had been previously balanced 100 per cent. Now the balance is calibrated for the unit as a whole and the balancing holes are drilled either at the front or rear or at both ends if necessary.

Following completion of assembly operations, the motors are transported to the testing department where each engine is given a routine block test, running on gasoline. This permits thorough inspection and adjustment of carburetor and ignition and makes the engine ready for the final assembly line.

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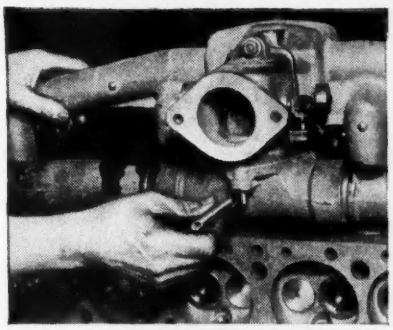
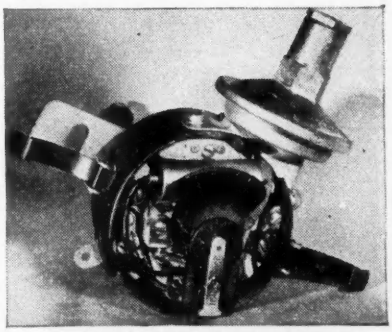
And think of the performance you get with INCO Nickel Alloys. These lustrous alloys are rustproof, tough and wear-resistant. They withstand extremes of temperature, and resist vibration fatigue and spark erosion.

Perhaps you have a metal problem right now. You can write us about it or call one of the distributors listed below. While you are at it, why don't you find out for yourself how surprisingly inexpensively you can get all the advantages of INCO Nickel Alloys in small diameter tubing, wire, wire cloth, small diameter rod, perforated metal and Su-veneer clad strip.



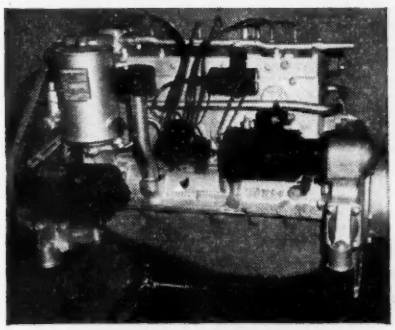
WITHSTANDS HEAT

Automotive choke tubes are made of Inconel for resistance to high heat and corrosion.



RESISTS SPARK-EROSION

Monel's resistance to spark erosion and corrosion increases performance of this distributor rotor.



PROVIDES STRENGTH

High strength of Monel enables use of smaller diameter wire to gain advantages of low capacitance in ignition wire.

INCO NICKEL ALLOYS ARE DISTRIBUTED BY:

Whitehead Metal Products Co., Inc.
Williams and Company, Inc.
Pacific Metals Company, Ltd.
Steel Sales Corporation
J. M. Tull Metal & Supply Co.
Metal Goods Corporation
Eagle Metals Company

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
NICKEL INCO ALLOYS MONEL* • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL* • NICKEL • "D" NICKEL • "Z" NICKEL
*Reg. U.S. Pat. Off.

1949 Lincolns

(*Continued from page* 28)

ing type replaces the three-quarter floating type axle. The rear wheels are now bolted directly to the flanged axle shaft ends. Hubs are eliminated, simplifying tire removal despite lower fender skirts. The wheels now drop almost vertically instead of out and then down.

All Lincoln models have synchronized transmission with three speeds forward and one reverse. Quiet operation in low, intermediate, high and reverse gears is obtained through use of helical gears. Automatic overdrive with 0.72 to 1 ratio is available at extra cost as factory installed equipment.

Higher Octane Gasolines at Service Stations

The average ASTM octane ratings of premium and regular-priced gasolines sold at filling stations during the summer of 1947 were higher than for the two summers preceding, according to the semi-annual survey of motor fuels conducted by the Bureau of Mines.

Based on the analyses of filling station samples collected in 17 marketing areas of the country, the octane rating of premium-price gasoline sold last summer averaged 79.2, compared with 78.3 the preceding summer, and 74.9 two years before. The average octane rating of regular-price gasoline last summer was 75.1, compared with 74.4 in the summer of 1946, and 69.7 in the summer of 1945.

Although octane ratings were higher last summer, little change was noted in the gasoline volatility and the distillation characteristics compared with the summer of 1946, according to the Bureau report.

HAVE YOUR
Products
HAD A SPRING CHECK-UP?

Have you analyzed the spring cost requirements for your products lately? In many cases, manufacturers find that they are wasting money—unnecessarily increasing the unit cost of their products—by using "luxury" springs.

It may not be essential, for example, to use springs with such close tolerances. Your specifications may unnecessarily call for ground-end springs—or fancy hooks that could be eliminated.

Why not have a Lewis Spring Engineer help you with spring specifications? Lewis engineers are thoroughly experienced in all phases of spring design and applicability to products. They can quickly recommend the most practical and economical spring or wireform for your particular requirements.

Now, with prices of component parts as they are, you'll find welcome relief in this opportunity to lower your costs without lowering product quality.

Lewis engineers have saved manufacturers thousands of dollars. There is a Lewis Spring Engineer near you who will be glad to work with you in deciding the most practical springs or wireforms for your products. Get *your* spring check-up now. There's no obligation.

LEWIS SPRING & MANUFACTURING COMPANY
2644 WEST NORTH AVENUE CHICAGO 47, ILLINOIS

Dr. Berrettoni Forms Own Organization

Dr. J. N. Berrettoni has announced the formation of the consulting organization of Dr. J. N. Berrettoni and Associates, in Minneapolis, Minn., specializing in setting up statistical quality control systems in manufacturing plants.

Allis-Chalmers' 1947 Net Totaled $5,422,308

For the year 1947, Allis-Chalmers Mfg. Co.'s net sales totaled $211,949,890 as compared with $93,840,030 for 1946. A net profit of $5,422,308 was realized in the year 1947, as against a 1946 profit of $144,487.

Packard's '47 Sales Up 26 Per Cent

Showing a 26 per cent increase over 1946, Packard Motor Car Co.'s net sales for 1947 totaled $116,625,091. Packard realized a net income of $1,100,691 in 1947.

CALENDAR

Conventions and Meetings

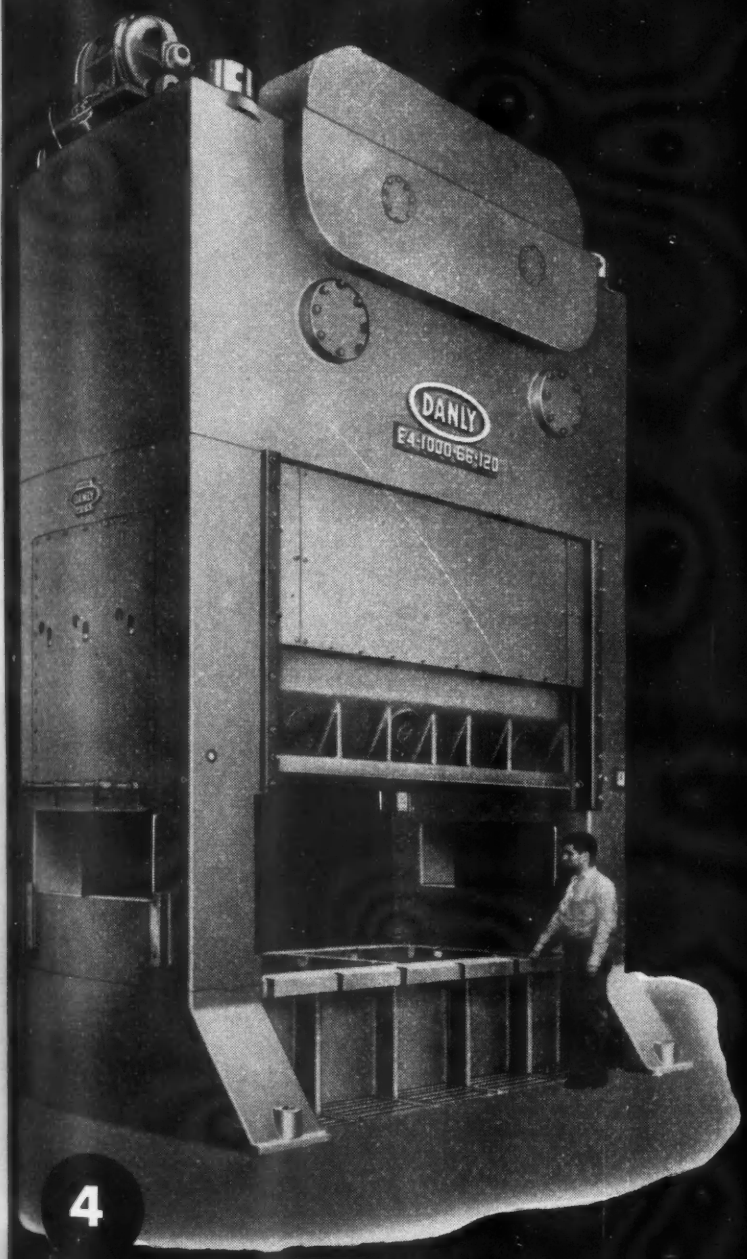
Metal Powder Assoc. Annual Mfg. & Exhibit, Chicago .....Apr. 15-16
Westinghouse Mch. Tool Electrification Forum, Buffalo .....Apr. 22-23
Chamber of Commerce of the U. S. Annual Mtg., Washington, D. C. Apr. 26-29
Amer. Management Assoc., Packaging Exposition & Conference, Cleveland Apr. 26-30
American Foundrymen's Assoc.—Foundry Show, Philadelphia .....May 3-7
British Industries Fair—Birmingham and London .....May 3-14
Natl. Highway Users Conference, Second Highway Transportation Congress, Washington, D. C. .....May 6-7
Soc. for Experimental Stress Analysis—Annual Mtg., Pittsburgh .....May 27-29
32nd International 500-Mile Race, Indianapolis .....May 31
Natl. Air Races, Cleveland ..... Sept. 4-6
Instrument Soc. of Amer., Natl. Instrument Conf. & Exhibition, Philadelphia Sept. 13-17
Commercial Motor Transport Show, London .....Oct. 1-9
Society of Motor Mfrs. International Motor Exhibition, London Oct. 28-Nov. 6

SIDE PRESSES HAVE . . .

teristics that make for long life and low maintenance.

Notice the rugged massiveness of the presses shown below—the modern enclosed construction that increases safety and operator acceptance.

Men who work with presses—supervisors, maintenance men, and operators alike—will find in the Danly Press, the features they want for better, faster press operation—the features that result in greater volume production of more accurate stampings at lower unit cost!



4

- 1 Sound, Clean Welding
- 2 Stress Relieved Weldments
- 3 Precision Machining
- 4 Rigid Enclosed Construction
- 5 Accurate Alignment
- 6 Circulating Filtered Lubrication System
- 7 Disc-Type Clutch and Drum Brake
- 8 Electrical Controlling

THESE FEATURES GIVE YOU—

- 1 Accurate Stampings
- 2 Trouble-free Operation
- 3 Less Tool Wear
- 4 Ease of Operation
- 5 Safety
- 6 Accessibility
- 7 Simplified Maintenance

Result—

Greater volume production of more accurate stampings at lower unit cost.

Engineering Library

2100 SOUTH 52ND AVENUE • CHICAGO 50, ILLINOIS

Magnetic Fluid Clutch

(*Continued from page* 40)

small fraction of the clutch torque—approximately one per cent—and the heat generated can be readily dissipated by proper design.

Determination of the type of liquid to use as a vehicle is based on such factors as difficulty in sealing, ability to withstand high and low temperatures, chemical stability and, of course, availability and price. Tests have been carried out at the National Bureau of Standards with light machine oil and a silicone fluid, as shown in Table I. Magnetic particles used, for the most part, have been carbonyl E iron. However, stainless-steel flakes and magnetic iron oxide have also been tested. It has been found that a mixture of light machine oil and carbonyl E iron, which is composed of particles with an average size of eight microns, gave the best results with the design of a three in. disk clutch.

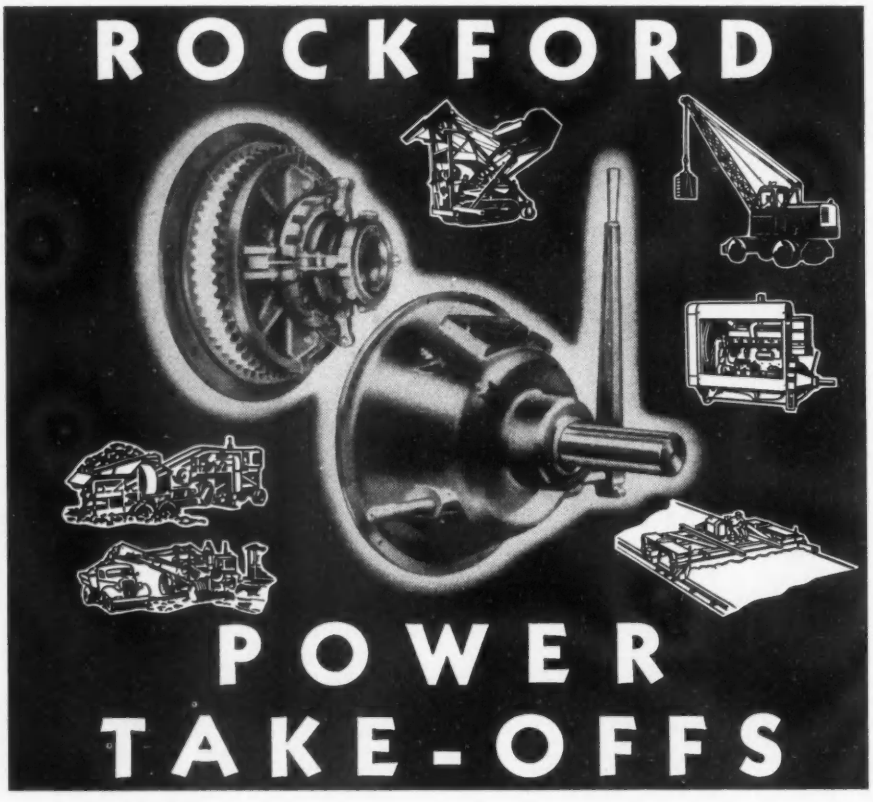
A problem which arises in the design of the magnetic fluid clutch is that of sealing the oil-iron mixture in its compartment. There are two separate places where such sealing is required. One is the point where the shaft supporting the internal member leaves the assembly, and the second, if an internal coil is used, is the point where the electrical leads are brought out. Good results have been obtained at the Bureau by using rubber O rings at the shaft bearing, but there is no doubt that other types of packing can be employed successfully. Also, to prevent iron particles from getting into the shaft ball bearings, it may be desirable to add a magnetic lock beyond the oil seal to trap any particles of iron which may get through the seal. The oil that passes beyond this point would then be clean and should have no harmful effect on the bearings. Such a magnetic lock may consist of a permanent magnet ring flanked by two iron washers, as shown in Fig. 2.

Several different magnetic fluid clutches have been built at the National Bureau of Standards. These have been of a basic and a simple form with only one or two plates and with the spacing of the plates fixed. However, multiple-plate clutches can be designed, and the sets of plates can be arranged in either series or parallel. The three-plate clutch of the design shown in Fig. 3 can be expanded to have any desired number of alternate driver and driven plates, as shown in Fig. 4. This clutch, which uses the series gap arrangement, is very compact, but heat dissipation presents special problems, particularly if the clutch is to be used continuously in a constantly slipping condition. Howeevr, air or liquid cooling could be provided in any of several different manners.

Experimental Results

Various experiments have been performed at the Bureau to determine the effect of gap on torque, the relationship between torque and speed, and the change in torque with current. A small cylindrical clutch was built from an ordinary two-pole electric motor, from which the armature had been removed and replaced with a cylindrical rotor one in. by 1¼ in. This remodeled motor was used with several different size rotors to determine the effect of gap length on the resulting torque. The results obtained are shown in Fig. 5. The fluid mixture consisted of nine parts of carbonyl E iron and one part of light machine oil by weight, and the cylindrical rotors were made of 47 per cent nickel steel in order to

(*Turn to page* 82, *please*)



SELF CONTAINED UNIT
WIDE RANGE OF SIZES *
CONSERVATIVE RATING
ROLLER BEARINGS
FINE ADJUSTMENT
ACCURATE BALANCE
S.A.E. DIMENSIONS

* ROCKFORD POWER TAKE-OFFS are available in standard sizes ranging from 210 foot pounds to 2100 foot pounds torque. Clutch sizes range from 8 to 14 inches double plate. These complete, self-contained units are suitable for heavy-duty gear-tooth application to current industrial gasoline and diesel engines.

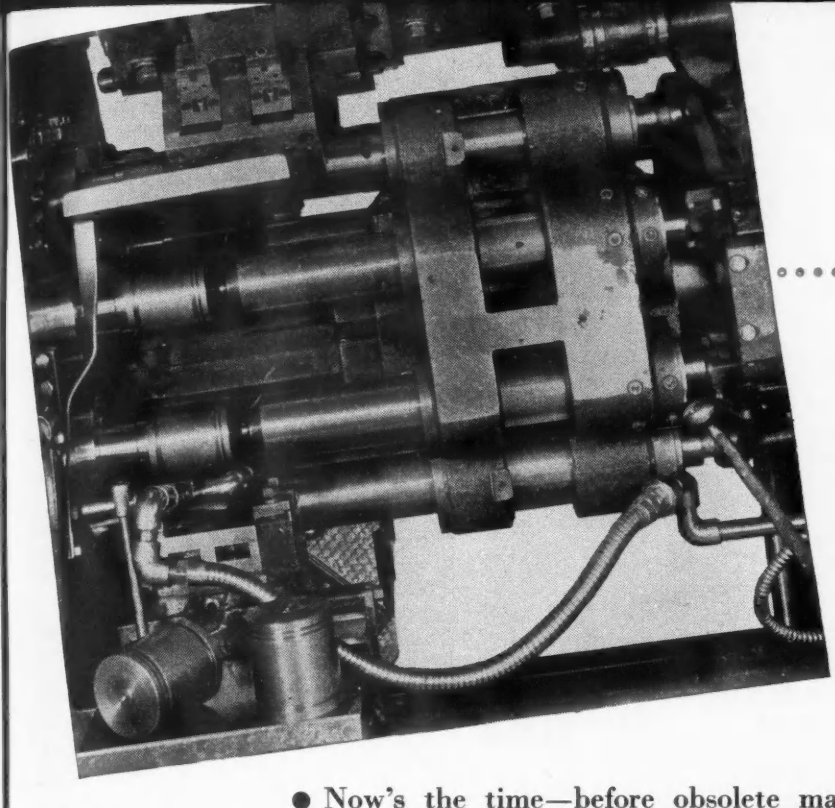
Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.

PLUS ON PISTONS

MACHINE TIME: 28½ SECONDS EACH



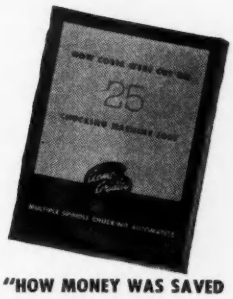
2nd MACHINE
14 OPERATIONS

Double indexing with duplicate tooling. Finish 2 pieces at once, using carbide-tipped tools. Machine time for both: 33 seconds (or at the rate of 16½ seconds each).

● Now's the time—before obsolete machining methods price you out of a competitive market—to investigate the savings in time, machines and money made possible by Acme-Gridley automatics.

Inherent features of their design are speed, stamina and adaptability. Rugged, box-type frame, plus positive close-coupled, quick-change camming provide a combination that's built for *speed* . . . as fast as modern carbide-tipped tools will take. You can hog off metal without sacrificing accuracy or finish; wide, open tooling zones allow plenty of room for time-saving, power-driven auxiliaries, and for efficient chip clearance.

These are some of the *plus* values you get in Acme-Gridley chuckers and bar automatics. They're built for quick change-overs; will up your output on long or short-run jobs. May we show you how?



"HOW MONEY WAS SAVED ON 25 CHUCKING JOBS"
Ask for your copy of this fully illustrated booklet of actual production jobs on Acme-Gridley chucking automatics.

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Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Magnetic Fluid Clutch

(*Continued from page* 78)

minimize the effects of residual magnetism.

Tests results obtained with a flat disk clutch, which had a driving plate 0.062 in. thick by three in. in diameter and an iron-oil gap of 0.062 in. on each side of the plate, are given in Figs. 6 and 7. The magnetic components of this design were also made of 47 per cent nickel steel, and the coil consisted of approximately 200 turns of No. 28 wire with a d-c resistance of 15 ohms. In the design of this clutch, no effort was made to make an efficient magnetic circuit since the gap area was large relative to the cross section of the magnetic material surrounding each side of the coil. Tests with this clutch indicated that the static friction is not appreciably different from the friction obtained under conditions of slip, as shown in the curves of Fig. 6.

A large cylindrical clutch built by the Bureau of Standards, of the type suitable for use in automobiles and machinery, was six in. in diameter and 6½ in. long. It was capable of transmitting 40 hp at 3000 rpm. The driven member consisted of a 1/16 in. thick cylinder mounted on a brass disk which in turn was fastened to the driving shaft, as shown in the cross-sectional drawing of Fig. 8. Rubber O rings were used as seals. The magnetic circuit was made of unannealed cold rolled steel with the end plates made of dural. The coil had 600 turns of No. 18 wire with a total resistance of 3.5 ohms. In order to keep the inertia of the driven member low, most of the magnetic circuit iron and the coil were made part of the driving structure. A photo of this clutch is shown in Fig. 7. Test results showing the relationship between the torque and magnetizing current with this clutch are given in Fig. 10.

A field in which this new clutch should find extensive application is in connection with servo-mechanisms. Such devices are now used for power steering of large trucks, tanks, steamships and aircraft, and for power brakes in heavy-duty trucks and some passenger cars. Here friction clutches have been used, but their lack of smoothness, changes in characteristics caused by wear, non-linearity and poor reproducibility of results have involved great difficulties. The new magnetic fluid clutch is expected to go far in solving such problems.

Another broad field of application is in constant torque and overload devices where the clutch need never be de-energized. Permanent magnets could be used for such service.

Save Money...
Reduce Assembly Time

MULTIPLE BREAKER INSTALLATIONS IN MANY COMBINATIONS NOW POSSIBLE

The dimples in the mount and circuit breaker case shown in the magnified view give the snap-action. Circuit breakers snap into the mount securely and quickly, by *finger pressure.* No spot welding. No screws. No tools needed. *And,* if desired, the mount can be attached to the car body . . . the circuit breakers assembled on the wiring harness, and snapped into the mount when the car is wired. Write for further information, or phone our Detroit office, 6432 Cass Avenue, Detroit 2, Michigan, Phone Madison 6300.

FASCO
CIRCUIT BREAKERS

Safeguard Operation of Automotive Electrical Equipment Instantly . . . Automatically . . . from Dangerous Overloads or Short Circuits.

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F. A. SMITH MANUFACTURING CO., INC., ROCHESTER 2, N. Y.

Electrical Engineering and Manufacturing Serving the Automotive Field Since 1922

Europe's Show

(*Continued from page* 33)

The stands of the bicycles, motorcycles and motor boats were fascinating. Bicycles provided with a small motor develop a speed of 25 to 30 km per hr (nearly 20 mph). However, the motor costs as much or more than the bicycle itself.

One of the curiosities of the show was the only "Tructractor" of the exposition, made by the Clark factory at Battle Creek, Michigan. This ingenious machine had just been introduced in Switzerland and is in use at the Geneva Airport, where they are always the center of attention of curious on-lookers.

BOOKS ...

With the progress in the development of industrial equipment, more and more problems are encountered in the forming and fabricating of parts of intricate design. The use of stainless steels in many industries is growing rapidly. A new book, FORMING OF AUSTENITIC CHROMIUM-NICKEL STAINLESS STEELS, was compiled to give fabricators of metal equipment a better understanding of the exceptional adaptability of stainless steels to all modern processes of forming. This book presents a detailed description of the modern forming procedures as applied to chromium-nickel stainless steels and as practiced in the fabrication plants of the United States. Bending and straight flanging; forming of curved sections and tubing; deep drawing; die forming; forming of contoured-flanged parts, and forming by miscellaneous methods are some of the methods discussed in the book.

The specific examples of forming technique are supplemented by details of tool design and tool materials, lubricants, data on dimensions, and consecutive steps in fabrication.

The book will be available only through International Nickel and copies, as long as they are available, may be obtained in the United States by mailing checks of $4.00 for each copy to the International Nickel Co., Inc., 67 Wall St., New York 5, N. Y., and in Canada by addressing the International Nickel Co. of Canada, Limited, 25 King Street West, Toronto 1, Ontario.

PRINCIPLES OF JET PROPULSION by *M. J. Zucrow*, 563 pp., pub. *John Wiley & Sons, Inc.*

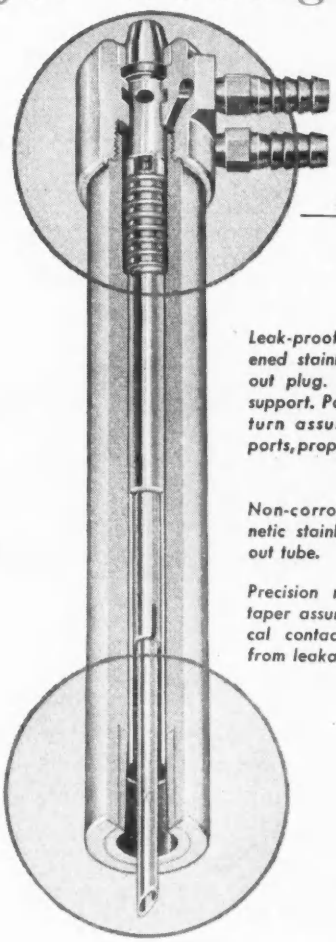
Said to be one of the first complete texts devoted exclusively to this subject, the book was written by M. J. Zucrow, professor of gas turbines and jet propulsion, School of Aeronautics, Purdue University. In the main it is based upon a lecture course given by the author during the latter part of the war under the sponsorship of the University of California. Intended for students of the subject, it covers the basic principles and analytical methods which should be of value to practitioners of the art as well. Generally speaking this text considers jet propulsion, the continuous combustion gas turbine, the turbojet engine, the three basic types of compressors, axial flow turbine, combustion chamber, high temperature metallurgy, and the rocket. To complete the well rounded coverage of the subject the author has included chapters on fundamental principles, thermodynamics of gas flow, thermodynamic properties of air, airplane performance calculations, and a section on the theory and design of the airplane propeller. The necessary fundamental units, mathematical equations, examples and tables and illustrations are presented profusely and in comprehensive form.

American Show Cars Can't Stay in England

Dissatisfaction is being expressed by importers of American automobiles at the refusal to allow cars brought in for exhibition at the first British postwar show, to remain in England. Automobile imports into the United Kingdom are only permitted on an import license, and while the necessary import certificates will be issued for exhibition purposes, the cars will have to be reexported at the close of the show. This situation is so unsatisfactory at a time when Britain has a free entry to the American market, that the representatives of manufacturers in the United States have lodged protests, so far without results.

(*Turn to page* 86, *please*)

"RAINCOATS"
for Welding Electrode Holders!



Leak-proof water seal hardened stainless steel knock-out plug. Double bearing support. Positive spring return assures free water ports, proper seating of tip.

Non-corroding non-magnetic stainless steel knock-out tube.

Precision machined Morse taper assures tight electrical contact and freedom from leakage.

HEAVY DUTY WATER-COOLED ELECTRODE HOLDERS ARE POSITIVELY LEAK-PROOF

Hard WW alloy taper socket of high electrical conductivity. Will not get out of round or leak.

Weiger-Weed engineers have put "raincoats" on WW water-cooled holders to make them really leak-proof—a fact absolutely demonstrated by hundreds of Weiger-Weed holders in service. Regardless of water pressure or temperature, Weiger-Weed holders do not leak. Here is an outstanding holder designed to end all holder trouble.

Ask for your copy of the Weiger-Weed manual to become familiar with Weiger-Weed products and service, to help you turn out stronger, lighter, more easily fabricated products at lower cost.

To supplement this efficiency—always use Weiger-Weed Spot Welding Tips. They give you good, sound welds with fewer dressings at lower cost. Made from Weiger-Weed special copper base alloys, they combine high electrical conductivity with greater wear resistance. You can get most sizes and shapes—pointed, radius, flat and offset—promptly from stock. Weiger-Weed also manufactures electrodes and parts for other resistance welding processes—seam welding wheels, flash, butt and projection welding dies, current-carrying shafts and bushings.

Weiger-Weed places at your service its special engineering and production skills to solve unusual resistance welding problems. Write for specific recommendations on your problem. Weiger-Weed & Company, Division of Fansteel Metallurgical Corporation, 11644 Cloverdale Avenue, Detroit 4, Michigan.

WEIGER-WEED
TRADE MARK
Resistance Welding ELECTRODES
DIES • TIPS • WHEELS • HOLDERS
DIVISION OF FANSTEEL METALLURGICAL CORPORATION

(*Continued from page* 85)

Under the flat rate taxation system which went into effect this year, one of the greatest obstacles to the sale of American cars, the tax on piston displacement, has been removed. This change was not made with any idea of favoring the American industry, but to enable British makers to break away from the small bore engines which were only suitable for local conditions. Should the market become free, the annual tax on the biggest American car would be no greater that that of the small British eight hp model. The immediate effect would be to boost sales and to increase the value of used American cars. At present a second-hand high horsepower American car is practically unsaleable because of the high tax based on cylinder bore. There is a belief that a clause permitting the importation of a certain quantity of American cars might be worked into the Marshall Plan.

More New Cars to Race in Indianapolis Classic

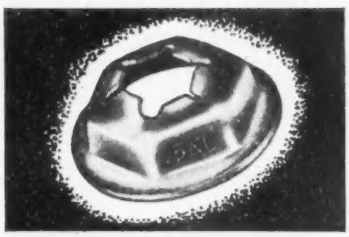
With 27 entries currently scheduled for official nomination for the 32nd annual 500-mile race at Indianapolis on May 31, three new cars are slated to make an appearance. The Don Lee team, representing the Thomas S. Less Enterprises, Inc. of Los Angeles, has a brand new four-cyl car now being built on the West Coast. Incidentally, this team also includes the 12-cyl Mercedes which is the same German car that raced last year which has been rebuilt entirely. This is said to be the fastest car entered in the race by race experts. A Schafer Gear Works Special, powered by a supercharged four-cyl 181 cu in. engine, with Duke Dinsmore designated as driver, is another new car. Les Anderson's Kennedy Tank Special, powered by a non-supercharged four-cyl 270 cu in. engine such as the power plants in last year's Blue Crown Spark Plug Specials, is also a new car.

Recently, an all-time record purse of about $160,000 for the race was predicted by Wilbur Shaw, president and general manager of the Indianapolis Motor Speedway. Officials are confident that approximately 60 will try to win places in the starting field of 33.

PALNUT SELF-LOCKING NUTS
For speedy low-cost assembly

Inverted PALNUTS

For moulding strips, medallions, tail and parking lights, radiator grilles, etc. Replaces regular nut and lock-washer.



Washer PALNUTS

For above applications where washer type base is desirable. One Washer "Palnut" replaces regular nut, lock-washer and plain washer.

Acorn PALNUTS

Pleasing dome shape covers bolt ends, improves appearance, protects car owners from injury. Used on glove compartments, rear decks and license brackets. Self-locking, replaces regular nut and lockwasher.

All "Palnuts" are readily adaptable to power tool assembly, further speeding up fastening and cutting costs.

Send details of assembly for samples and data

THE PALNUT COMPANY, 60 Cordier St., Irvington 11, N. J.

Detroit Office: 5-213 General Motors Building

PALNUT SELF-LOCKING NUTS
TRADEMARK

Current Automotive Patents Issued

Supercharger. Boleslaw Szczeniowski, Montreal, Quebec, Canada. (2,434,678).

Power Drive Control System for Motor Vehicles. Glenn T. Randol, Detroit, Mich. (2,434,717).

Supercharger for Automotive Vehicles. Stanley M. Udale, Detroit, Mich., assignor to George M. Holley and Earl Holley (2,434,726).

Gearbox Control Device. Gaston Chausson assignors to Societe Anonyme des Usines Chausson, Asnieres, France (2,434,735).

Power Plant Comprising a Gas Turbine and an Internal-Combustion Engine Compressor Serving as a Gas Generator Therto. Robert James Walsh, Rubgy, England, assignor to The English Electric Co., Ltd., London, England (2,434,777).

Turbine Cooling. Richard S. Buck, Glastonbury, and Andrew Kalitinsky, assignors to United Aircraft Corp., East Hartford, Conn. (2,434,901).

Detonation Pickup, John R. Burns and John M. Whitmore, assignors to General Motors Corp., Detroit, Mich. (2,435,031).

Airplane Engine and Propeller Pitch Control. Arthur W. Gardiner and Willard T. Nickel, assignors to General Motors Corp., Detroit, Mich. (2,435,037).

Helicopter Rotor Control. Walter S. Hoover, South Newfane, Vt. (2,435,080).

Internal-Combustion Engine Heater. Henry Milton Reich, Pittsburgh, Pa. (2,435,101).

Compound Internal - Combustion Turbine Plant. Fritz Albert Max Heppner, Leamington Spa, England, assignor to Armstrong Siddeley Motors Ltd., Coventry, England (2,435,138).

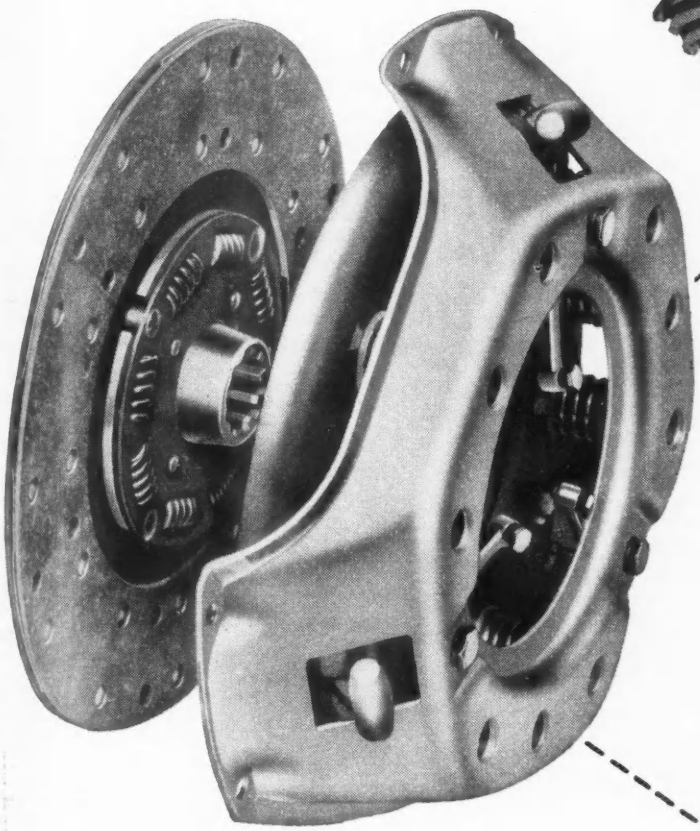
Direct-Acting Hydraulic Shock Absorber. Edwin F. Rossman, assignor to General Motors Corp., Detroit, Mich. (2,435,160).

Resilient Torsion Rod Suspension for Tanden Axle Vehicles. Lawrence R. Buckendale, assignor to The Timken-Detroit Axle Co., Detroit, Mich. (2,435,199).

Preheated Fuel Injection Device for Internal-Combustion Engines. Robert H. Hancock, Miami, Fla. (2,435,213).

Hydraulic Clutch and Final Drive Shaft Unit for Tractor Vehicles. William T. Stephens, assignor to Hydraulic Control Engineering Co., Cleveland, Ohio (2,435,244).

The foregoing patents were compiled from latest issues of the OFFICIAL GAZETTE *of the U. S. Patent Office. Copies of the individual patents may be obtained from the Commissioner of Patents, Washington, D. C., at a cost of* 25 *cents each. The number of each patent is given in parenthesis.*



Take it Easy!

LONG CLUTCHES ARE DESIGNED FOR EASY, SURE OPERATION

Automotive engineers know how much *relaxation* means to car owners. They constantly strive to provide effortless means of operating the automobile's various units.

That's the chief reason for the popularity of Long clutches, used widely throughout the automotive industry since 1922. Long semi-centrifugal clutches respond dependably to easy pedal pressure at high or low speeds; in stop-and-go driving. And, because of its semi-centrifugal design, there is less slippage of parts; less wear.

Long clutches equip millions of cars, trucks, buses and tractors. Long Manufacturing Division, Borg-Warner Corporation, Detroit 12, and Windsor, Ontario.

A PRODUCT OF B-W BORG-WARNER

LONG

CLUTCHES • RADIATORS • OIL COOLERS

Personals

Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.

Perfect Circle Corp.—**Jack A. Taylor** has been appointed Sales Promotion Manager.

Shakeproof, Inc.—**Charles F. Keyser, Jr.** has been appointed Manager of Distributor Sales.

Reynolds Metals Co., Aluminum Div.—**R. W. Christensen** has been appointed Asst. Advertising Mgr., succeeding **J. C. Bjorkholm,** recently made Advertising Mgr. of Reynolds Foil Div. **S. M. Walton** has been made industry manager of the Alumi-Drome Div.

Packard Motor Car Co.—**Fred W. Adams** has been made Advertising Manager. **Raymond E. Danto,** appointed Manager of the Organization and Analysis Dept.

Kaiser-Frazer Corp. — **Henry M. Swartwood** made Director of Advertising. **E. J. Duffy,** Manager, Ironton Blast Furnace Div., Provo, Utah.

Fairchild Engine & Airplane Corp. —**J. Carlton Ward, Jr.** elected Chairman of Board of Directors. **Lawrence B. Richardson,** formerly Vice-President Curtiss-Wright Corp., succeeds Mr. Ward as Fairchild president.

Bell Aircraft Corp.—Two new directors elected are **David M. Milton** and **Webster B. Todd.** Directors who have resigned are **C. A. Criqui, John W. deForrest, Mark J. Millard** and **Ansley W. Sawyer.** Mr. Sawyer will continue as counsel for Bell.

Westinghouse Electric Corp.—**G. E. Stoltz** appointed Consulting Metal Working Engineer of Industry Engineering Dept. and **W. R. Harris,** Manager of Metal Working Section Industry Engineering Dept.

Northrop Aircraft, Inc.—**J. V. Naish** has been made Factory Manager. **C. B. Spencer** has been named Asst. Factory Mgr. and Production Supt.

The Timken Roller Bearing Co.—**George Reed** has been appointed Sales Engineer of the Steel and Tube Div.

Shafer Bearing Corp.—**George W. Nordstrum,** elected a Director of the company.

U. S. Asbestos Div., Raybestos-Manhattan, Inc.—**James A. Wheatley, Jr.** Replacement Sales Mgr.

Sheffield Corp.—**John E. Barbier,** Sales Mgr. of Murchey Machine & Tool Co., subsidiary of Sheffield.

Superdraulic Corp.—**David D. Wood,** promoted to General Manager.

Nash Motors—**Howard G. Coates** appointed Factory Supt. El Segundo, California Plant.

American Brake Shoe Co.—**J. P. Kleinkort** appointed General Sales Mgr., Ramapo Ajax Div.

Standard Motor Products, Inc.—**W. L. Morris,** Field Sales Mgr., Hygrade Div.

Pennsylvania Salt Mfg. Co.—**J. Phillip Evans,** Asst. to Manager of Research and Development Div.

Newcomb-Detroit Co.—**Julius W. Marx,** Chief Engineer.

Mullins Manufacturing Corp.—**Earl W. Stansel** appointed Asst. to Vice-President in charge of Operations.

Bowen Products Corp.—**John L. Cotter,** elected Vice-President and Director.

THE

TUTHILL GIANT

stands for

Simplicity, Effectiveness, Precision, Experience

1. The *simplicity* of Tuthill design means low cost. No radius rods are needed. No torque arms.
2. The *effectiveness* of Tuthill Leaf Spring action means smooth riding.
3. The *precision* of Tuthill heat treatment means perfect temper. Alloy spring steel is treated under pyrometer control. This gives unmatched fatigue resistance.
4. The *experience* of Tuthill craftsmen means consistent quality.

Choose Tuthill for your own installations.

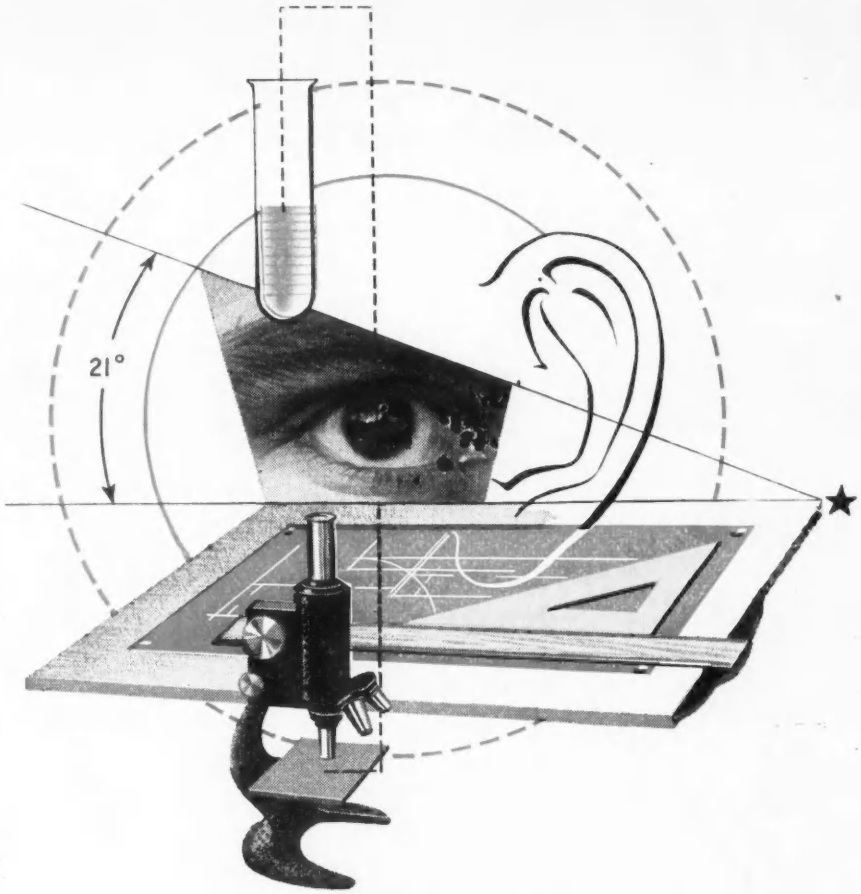
IF YOU HAVE

springing problems, tell us. Our engineering department will be glad to advise. There is is no obligation.

WE RECOMMEND TUTHILL FOR QUALITY SPRINGS

TUTHILL SPRING CO.
762 WEST POLK ST.
CHICAGO 7, ILLINOIS

Spring Makers since 1880



AND THE KNOW HOW IS FREE

You may have an equipment* problem in which AC's 39 years of "know-how" will be of great value, to your engineers, your production heads, your sales department . . . or all three. For the improvement of a product, in quality, just as well as in sales appeal, may often be accomplished by "know-how," rather than by simply increasing the cost. The "know-how" is free.

Perhaps your "know-how," plus ours, would be very productive. Certainly, it will pay you to investigate AC's wide variety of standard and special equipment units, used by many of America's foremost builders of vehicles and engines. Your inquiries are solicited and will receive prompt attention.

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

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Detroit 2, Michigan

Mott Foundation Bldg.
Flint 3, Michigan

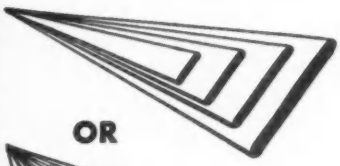
73 E. Wacker Drive
Chicago 1, Illinois

* AIRCRAFT SPARK PLUGS · AIR CLEANERS · AMMETERS · CARBURETOR INTAKE SILENCERS · CARBURETOR INTAKE SILENCER AND AIR CLEANERS · CRANKCASE BREATHERS · CRANKCASE VENTILATION VALVES · DIE CASTINGS · DIE CASTING MACHINES · BACK FIRE DEFLECTORS · FLEXIBLE SHAFT ASSEMBLIES · FUEL OIL FILTERS · FUEL PUMPS · FUEL AND VACUUM PUMPS · GASOLINE GAUGES · GASOLINE STRAINERS · IGNITION CABLE TERMINALS · INSTRUMENT PANELS · LUBRICATING OIL FILTERS · OIL FILTER REPLACEMENT ELEMENTS AND CARTRIDGES · AIR GAUGES · OIL GAUGES · RADIATOR PRESSURE CAPS · REPLACEABLE AIR CLEANER ELEMENTS · AUTOMOTIVE SPARK PLUGS · SPARK PLUG CLEANERS · SPARK PLUG GAPPING TOOLS · SPARK PLUG TESTERS · SPEEDOMETERS · SPEEDOMETER AND TACHOMETER DRIVE ADAPTERS · TACHOMETERS THERMO GAUGES · VACUUM PUMPS · VOLTMETERS

AC

Engineering Library

PAGE
Stainless Steel
WIRE
ROUND

FLAT

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Remember that the next time you are looking for a responsible source for stainless steel wire. Wire has always been the business of PAGE. And PAGE has been working with stainless ever since its earliest development.

Whatever problem you may have involving wire—

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PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

In Business for Your Safety

PUBLICATIONS

(Continued from Page 58)

H-92—Aircraft Catalog

Continental Screw Co. — Aircraft Catalog No. 11 contains complete information on aircraft screws, bolts and nuts. Special features of the catalog include a thumbcut index; in addition to appearing on the thumbcut index, basic parts numbers are shown in a box at the top of every page. Packing information is given above and below these boxes. Automatic discount and finish finder and supplementary discount sheet are included.

H-93—Adhesives in Industry

Minnesota Mining and Manufacturing Co.—A 28-page brochure entitled 3M Adhesives in Industry contains many pictures, cites case histories and lists approximately 26 of the more than one thousand formulas offered by the company's adhesives and coatings division. Bonding operations such as plywood-to-metal and vinyl-sheeting-to-wood are pictured. Sealing operations on aircraft and automobile bodies; protective and anti-corrosion coatings for metal are discussed.

H-94—Heating and Annealing Non-Ferrous Alloys

Surface Combustion Corp., Technical News Bureau—A new 4-page Bulletin, No. SC-136, describes heating and annealing of copper and brass and other non-ferrous alloys in Surface furnaces. The bulletin is illustrated, shows recommended methods of heating and heat treating slabs, sheets, strip billets and coils and also shows furnaces for copper, brass, nickel, silver and precious metals. Both direct and radiant tube fired furnaces and those using prepared atmospheres are shown. Included is a chart showing the effect of annealing temperatures on high brass.

H-95—Highway Safety

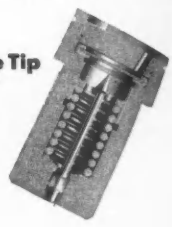
Inter-Industry Highway Safety Committee—A new booklet is available on policies and operation. It includes an insert outlining the five suggested safety projects for cooperative action by state and local Inter-Industry Committees. The booklet tells what the Committee is, why it was organized, its policy, program, etc.

SAVE UP TO 25%
on DIESEL
FUEL INJECTION
NOZZLES and
HOLDERS

. . . by specifying
EX-CELL-O

It's true. You can cut engine costs and eliminate field service problems . . . simply by specifying EX-CELL-O Diesel Fuel Injection Nozzles and Holders. They are outwardly opening, differential type pintle nozzles designed to give you maximum efficiency from high speed Diesel engines of 5 to 300 H.P. Installation? Simple. No drain lines required, no adjustments necessary. Each unit self-contained, factory calibrated and sealed. Cost? *Approximately 25% less than any other nozzle on the market!*

Replaceable Nozzle Tip
Cross-sectional view shows simplicity of design. Only 3 working parts.



Write today for this booklet containing complete information.

Fuel Injection Division
EX-CELL-O CORPORATION
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the best brake is AIR

The logic of installing the safest possible brakes on a vehicle is indisputable—and that means Bendix-Westinghouse Air Brakes, of course. But when you back up that logic with the dollar and cents fact that the extra protection *pays for itself* in a short time, you have an investment too good to pass up. Vehicles carry heavier payloads safely, travel on faster schedules, drivers are better satisfied, and service costs lower—all because of Air Brakes. Check with your Bendix-Westinghouse Distributor. He'll show you why the best brake is AIR.

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BENDIX-WESTINGHOUSE
GENUINE
AIR BRAKES
TRADE MARK REGISTERED

the best AIR brake is

Bendix-Westinghouse

General News

(*Continued from page* 23)

GM Opens Plant In Georgia

GM expects to open its B-O-P assembly plant at Doraville, Ga. soon, possibly about the first of May. The plant is now being prepared for production with pilot assembly underway on a limited scale. More than 500 employes are already at work at the new plant, which cost an estimated $6 million and which has one million sq ft of working area.

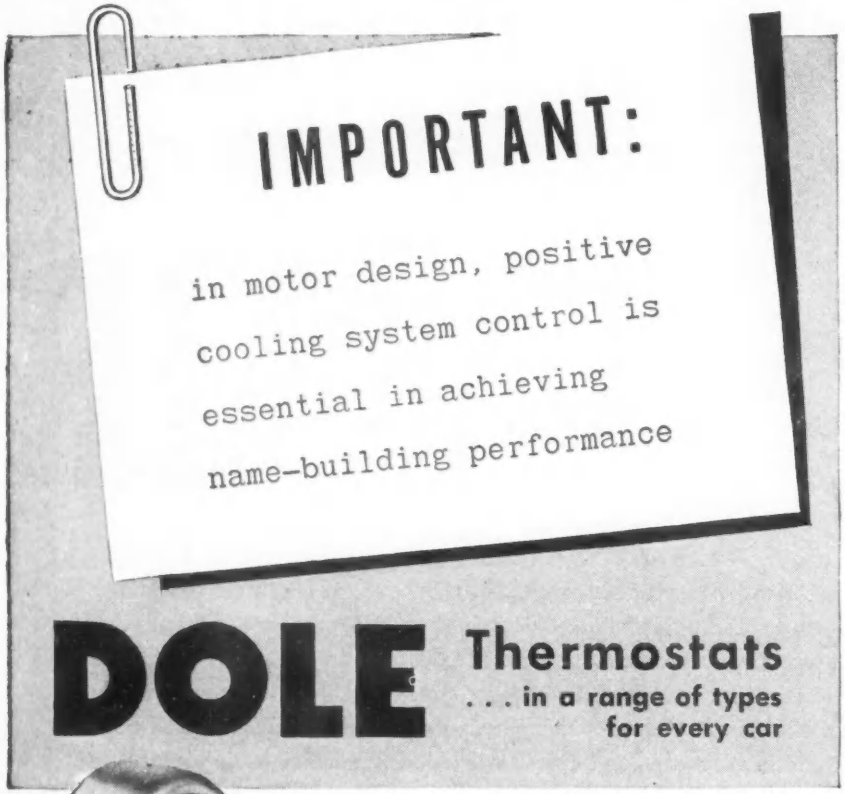
1948 MOTOR VEHICLE FACTORY SALES FROM U.S. PLANTS*

	Passenger Cars	Trucks	Buses	Total Motor Vehicles 1947	Total Motor Vehicles 1946
January	305,081	99,200	1,370	405,651	347,696
February	274,847	107,054	1,110	383,011	373,360
Total—2 Months	579,928	206,254	2,480	788,662	721,056

1948 FACTORY SALES TO DOMESTIC AND FOREIGN MARKETS*

	Passenger Cars		Trucks		Buses	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
January	285,373	19,708	83,893	15,307	1,068	302
February	256,753	18,094	88,889	18,165	772	338
Total—2 Months	542,126	37,802	172,782	33,472	1,840	640

* Automobile Manufacturers Association.


IMPORTANT:
in motor design, positive
cooling system control is
essential in achieving
name-building performance
DOLE Thermostats
. . . in a range of types
for every car
Stop-and-go control of cooling liquids—as provided by a Dole Thermostat—contributes to better motor operation and the improved performance on which a car's reputation is built. At all seasons, a Dole Thermostat assures quick warm-up—plus worthwhile savings in gas, oil and motor wear.
THE DOLE VALVE COMPANY
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LOS ANGELES • DETROIT • PHILADELPHIA

It Should Have Been Caterpillar

It was incorrectly stated on page 206 of the March 15, 1948 issue of AUTOMOTIVE INDUSTRIES in a story titled "Caterpillar Introduces Two New Bulldozers" that "The No. 2A and 2S round out the line of bulldozers manufactured for exclusive use with the Diesel track-type tractors produced by International." The Caterpillar Tractor Co., of course, is the manufacturer of the Diesel track-type tractors for use with Caterpillar bulldozers.

Govt. to Keep Control of Synthetic Rubber Plants

Control of the synthetic rubber industry will remain in government hands for at least two more years under legislation passed by Congress Mar. 31. The measure requires the government to keep operating and in standby condition, plants with a total rated capacity of 600,000 tons annually of general purpose synthetic and 65,000 tons of special rubber. It also decrees that rubber goods manufacturers must use a minimum of 222,000 tons of synthetic rubber a year, permits private companies to buy or lease any plants not required to maintain the specified national capacity, and disbands the national wartime patent pool under which the rubber companies exchanged information since 1941. The act also declares that the best national interest is served by getting the rubber making industry into private hands, but defers action until Congress can work out details for doing so.

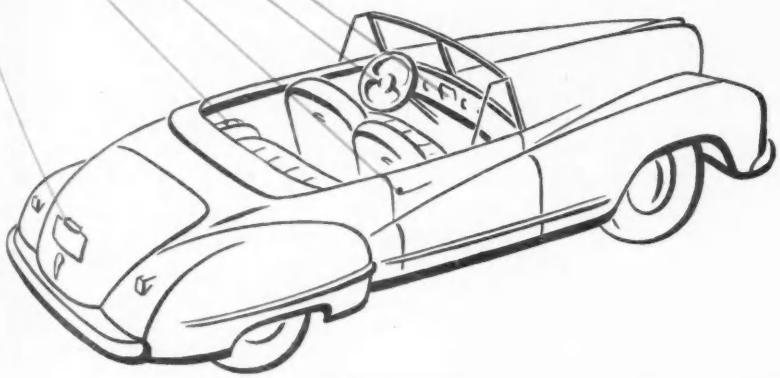
GM Wins 4th Award for Safety

GM has won its fourth honor award for industrial safety in five years. The National Safety Council, which made the award, says that GM is the first organization to win a fourth award of honor on a company-wide basis. GM's accident frequency rate last year was 26 per cent better than in 1946, and its severity rate was 23 per cent better.

(*Turn to page* 98, *please*)

STYLING

SELL YOUR CAR TOMORROW



GIVE IT MICRO-STYLING...GIVE IT "LUCITE"

THE TIME-TESTED PLASTIC

WHY USE "LUCITE"? Few materials can be more useful to you in MICRO-STYLING your car for eye-catching beauty and practicability too than Du Pont "Lucite" acrylic resin. Look at all these special features!

BEST FOR UTILITY... Time-tested on cars since 1937, "Lucite" resists breaking, sunlight and bad weather. It is not damaged by gasoline, lubricants, or by many common solvents that cause crazing of some plastics. Proved for exposed lenses, hood motifs, and trim.

BEST FOR STYLE... Because "Lucite" offers excellent opportunity for smart, practical design. Use it for dial faces, horn buttons, knobs, etc. Comes in a wide range of color-fast hues, transparent, translucent and opaque.

BEST FOR LIGHT-REFLECTION...

That's right! Tests show that "Lucite," because of its light-transmission and its ability to be molded accurately, is especially excellent for reflectors. In transparent form, it transmits up to 92% of light. It also "edge-lights" and can "pipe" light around curves.

WRITE FOR FREE LITERATURE on "Lucite" and other Du Pont plastics. No obligation. If you wish, Du Pont technical men will be glad to consult with you in confidence and advise on applications of Du Pont plastics to help your MICRO-STYLING plans. Address: E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Room 204 Arlington, New Jersey.

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Plastics
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

General News

(*Continued from page* 92)

Name Bennett Official of North American Motors

Harry Bennett, former Ford Motor Co. official, has been made a director and vice president of North American Motors Corp. The new automobile company is planning to build a lightweight, low-priced automobile in Grand Prairie, Tex. President of the company is John T. Tjaarda, formerly chief designer for Briggs Mfg. Co. The company also announced election of Norman De Vaux, formerly president of Chevrolet Motors Co. of California, to the board of directors.

SAE Nat'l Transportation Mtg. in Philadelphia

The SAE National Transportation meeting was held in Philadelphia on March 30-31 and April 1, 1948. The program included: March 30—Providing Safe Transportation in Buses, K. L. Raymond, GMC Truck and Coach Div., General Motors Corp.; Operating Experience with Weight Reducing Materials in Vehicle Design, J. L. S. Snead, Jr., Consolidated Freightways, Inc. March 31—Electrical Equipment and Its Application, J. H. Bolles, Delco-Remy Div., General Motors Corp.; Fuel Injection for Spark Ignited Automotive Engines, G. M. Lange and C. W. Van Overbeke, Ex-Cell-O Corp. April 1—High Temperature Cooling Systems, F. M. Young, Young Radiator Co.; Experience with Apprentice Mechanic Training, A. W. Newman, The Willett Co.

Standardize on Kester Cored Solders!

Be absolutely sure of the correct amount of flux and get perfect soldering results every time. Use Kester Cored Solders with their scientific, pure and uniform flux core.

Troubled with a difficult soldering operation? Consult our engineers on any soldering problem. No obligation to you.

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Factories also at:
Newark, N. J.
Brantford, Canada

Reo Shows '47 Profit of $4,894,400

Reo Motors, Inc. reported a net profit last year of $4,894,400. H. E. Hund, president and general manager, said that sales were 35 per cent above the level of 1946, and that earnings for 1946 and 1947 exceeded the combined earnings of the 1942-1945 period when sales were twice as high.

Allison Potential Output 2000-4000 Jets Monthly

GM's Allison Div. currently the largest producer of jet aircraft engines could, if given two years, build 2000 to 4000 such engines a month, according to a report from Indianapolis. It is estimated that such a program would require about 2.5 years of intensive planning and preparation and an increase in employment of from 30,000 to 35,000 from the present 6000 level. In addition to jet engines which it builds under license from General Electric, Allison is currently producing a large number of automotive products. It is operating four of its own plants and two others owned by the government. The company has reportedly only about one third of the machine tools used on war engine production still in operation, and any large scale engine program would require a heavy investment in tooling and a long period of time to complete.

New Plant in Ohio for GM's Packard Electric

A new plant, comprising 186,000 sq ft, was recently dedicated in Warren, O. for GM's Packard Electric Div.

Obituary

Russell H. McCarroll

Russell H. McCarroll, 58, director of chemical engineering and chemical and metallurgical research of Ford Motor Co. died Mar. 31 in Bay City, Mich.

Earl Nevin

Earl Nevin, 59, assistant tractor and implement sales manager for Dearborn Motors Corp., died suddenly Mar. 31 in Detroit.